ONI STUDY 3-62

POISONOUS SNAKES OF THE WORLD

A Manual for Use by U.S. Amphibious Forces

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
OFFICE OF NAVAL INTELLIGENCE

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LETTER OF PROMULGATION

1. ONI Study 3–62, "POISONOUS SNAKES OF THE WORLD (A Manual For Use by U.S. Amphibious Forces)", is an unclassified publication. It has been compiled by the Medical Unit of the Office of Naval Intelligence in response to a request from the Bureau of Medicine and Surgery and contains information regarding the geographic distribution, identifying features and habitat of snakes sufficiently venomous to present a threat to human life. It contains, in addition, sources of antivenom and procurement data available at the time of publication.

2. This study is intended to serve as a personnel training and indoctrination manual for all personnel and as a field identification guide to the most dangerous poisonous species of snakes in all geographic areas bordering the oceans. It is not, however, an exhaustive treatment of all poisonous snakes.

3. First aid procedures in case of snakebite as described herein have been approved by the Bureau of Medicine and Surgery and the specific treatment set forth represents the official policy of that Bureau at the time of publication.

4. Requests for this publication may be submitted in accordance with ONI INSTRUCTION 05601.4 (effective edition). Other than U.S. Naval activities may request copies through appropriate inter-agency channels. Copies of this publication held in excess of requirements may be returned to CNO (Op–923M1).

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CHAPTER I

Introduction

1. PURPOSE

Personnel of the U.S. Navy and Marine Corps find themselves stationed, visiting, or conducting operations of one kind or another, in most if not all the countries of the world bordering the oceans. In most of these countries snakebite represents a definite hazard to the health, not to say life, of individuals so engaged, particularly those unacquainted with poisonous species of that region. The potential hazard of snakebite increases during amphibious operations, especially in areas more or less tropical and/or uninhabited.

Neither military nor naval forces have experienced casualty rates from snakebite sufficiently high to jeopardize the outcome of operations. However, the possibility of snakebite creates a morale problem of considerable proportions and may result in personal tragedies unless the individuals at risk possess the requisite knowledge and training to accomplish the necessary preventive and curative procedures required.

This study represents a compilation of information obtained from an extensive review of the pertinent literature in the technical libraries in Washington, D. C. and from material collected for the Office of Naval Intelligence in many foreign countries. A list of general reference works is given in the appendices. Scientific terminology has been reduced to the minimum necessary to present accurate information. Words and terms thought to be beyond the immediate comprehension of non-scientific personnel are defined in the glossary.

Photographic material included herein represents, in so far as possible, typical forms of the species shown and appear in this study by the courtesy of many individuals and organizations.

CHAPTER II

Precautions To Avoid Snakebite

1. GENERAL

The best way to avoid being bitten by snakes is to stay away from them. However, since one has little choice in his duty assignment, there are certain precautions to help one not acquainted with the habits and habitats of snakes to avoid them, should he find himself in "snake country". In an area where the terrain affords protective cover and subsistence for snakes, it is always advisable to carry a snakebite first aid kit. A good snakebite kit, known as "Snakebite Kit, Suction (FSN 6545–952–5325)", may be ordered through the Armed Forces Supply Agency. When such kits are not available the following items make an adequate substitute: an antiseptic, a sharp knife, razor blade or other sharp instrument, and a piece of rubber tubing or similar item to be used as a tourniquet. Any device capable of creating suction over a bite would also be useful. If practicable it is also well to carry in such a kit a 10 milliliter (ml.) vial of sterile physiological salt solution and a 1 ml. syringe and needle with which to conduct horse serum sensitivity tests (see Chapter IV, paragraph 2, step 9).

2. IMPORTANT REMINDERS

When in snake infested country it is important to:

a. **Remember that most snakes are more afraid of humans than humans are of snakes** and that, given a chance, they will depart an encounter immediately.

b. **Avoid walking about at twilight, during the night and shortly after sunrise,** when at all possible. Snakes in general, and poisonous species in particular, become more active during the night. Specific exceptions to the rule that snakes are nocturnal are discussed in the species descriptions, Chapter VII.

c. **Avoid snake den areas.** Snakes select as dens those places that afford protection from observation and the elements. In the temperate zone, they select places below the frost line of the ground. Snakes are likely to be most numerous in den areas when going into hibernation in the fall and when coming out of hibernation in the spring. During other times their presence is not unusual in den areas.

d. **Avoid disturbing snakes.** The psychological state of the snake at the time of biting is important. If it is disturbed rather than merely surprised, it may inject more venom. Poison snakes possess more concentrated venom and the largest quantity thereof in the spring after coming out of hibernation. Snakebites during this time of the year are likely to be more serious than at other times; however, snakebite by a poisonous species is likely to be dangerous throughout the year.

e. **Avoid swimming in areas where snakes abound.** All snakes swim very well and many of them can stay under water for extended periods of time. Poisonous snakes are just as dangerous in water as they are on land; however, their capability of striking may be reduced when in the water. A bite inflicted under water, when mechanically effective, is just as dangerous as on land.

3. SPECIFIC PRECAUTIONS

If in snake country, certain precautions or DON'Ts may aid in avoiding snakebite. For instance,

a. DON'T place your hands, gloved or ungloved, on rock ledges, under boards, in hollow logs, or near places where a bite by an unseen snake could occur. Snakes particularly enjoy sunning themselves on rock ledges.

b. DON'T step into such places barefooted or while wearing sandals or other footwear not affording protection against snakebite.

c. DON'T sit down in areas possibly infested with snakes without looking around.

d. DON'T camp near piles of brush, rocks or other debris where snakes may be found.

e. DON'T sleep on the ground if it can be avoided.

f. DON'T gather firewood or other objects at night when you cannot see clearly all around the area where you step or reach.

g. DON'T step over a rock or log, even in the day time, without examining what is on the other side.

h. DON'T turn debris or other objects away from you when you wish to look beneath them, but instead turn them toward you. Such objects may then shield you from the bite of a snake possibly lying underneath.

i. DON'T walk close to rock walls or ledges where unseen snakes may be in hiding. Stay a few feet away or inspect carefully as you walk along.

j. DON'T hike alone in snake infested country if it can be avoided. It is imperative to have at least one companion to perform lifesaving first aid and to catch, kill or identify the snake.

k. DON'T enter snake infested country without adequate protective clothing. Wear heavy leather gloves with gauntlets and thick leather boots.

l. DON'T handle freshly killed venomous snakes; always use a stick or other instrument to manipulate them. Such snakes may still, by reflex action, inflict serious if not fatal bites.

m. DON'T pick up any snake without reason or without positive knowledge that it is of a non-poisonous species.

Perhaps the best precaution is to determine in advance, if possible, the species of snakes inhabiting the country in which one is going. Learn how to identify them and as much about their habits as possible. Then regulate all activity so as to take advantage of this knowledge.

CHAPTER III

How To Recognize Snakebite (Signs and Symptoms)

1. GENERAL INFORMATION

Snakebite all too frequently occurs in the absence of individuals acquainted with the nature thereof and many victims are unable to accurately describe the snake that bit them. It is therefore necessary that all military and naval personnel should be acquainted with the general signs and symptoms of snake bite in order to take the proper steps in first aid (See Chapter IV). Victims of snakebite, regardless of the supposed venomous or non-venomous nature of the snake, should be brought under the care of a physician as soon as practicable.

When a snake bites a person the venom is injected into the soft tissue beneath the skin through the grooved or hollow fangs and spreads immediately several millimeters in all directions. There are at least two ways in which the venom is spread through the body: (1) **By blood circulation** following direct injection into a blood vessel. This occurs rarely but may be rapidly fatal without immediate medical attention. (2) **By lymphatic circulation.** Lymph (the **liquid** portion of blood as distinguished from the **solid** blood cells) bathes all body tissues and eventually returns to the blood stream. It flows more slowly than the blood stream and this very likely is part of the reason for the delay in development of recognizable symptoms in some cases of snakebite. The mode of action of neurotoxins is not exactly known at the present time.

2. TYPES OF POISONS IN SNAKE VENOMS

Snake venoms contain substances destructive of tissue cells, nervous tissue and blood cells, in addition to other components which cause a variety of symptoms. Certain fractions of venoms (i.e., cytolysins) destroy by chemical digestion the tissue with which they come in contact. For example, some snake venoms destroy the small blood vessel (capillary) walls, which results in bleeding into the tissues. The symptoms produced by the venoms of snakes in a particular locality, when correlated with the venomous species common to that area, can be a vital means of selecting the proper first aid and/or treatment when the snake's identity is not positively known. Table I sets forth the major substances in snake venoms together with the effects thereof.

3. NEUROTOXIC AND HEMOTOXIC SYMPTOMS

a. When a victim receives venom that is chiefly **neurotoxic** in action, the symptoms which develop are:

(1) **Impairment of blood circulation** as a result of the venom's effect on the heart. The heart beat becomes irregular (cardiac arythmia) or perhaps partially or completely paralyzed, causing a depression of the heart's output, a decrease in blood pressure, generalized weakness and exhaustion terminating in shock.

(2) **Severe Headache** may follow peripheral vascular changes due to neurotoxin.

(3) **Vertigo (dizziness)** results from the venom's action on the nerves of the inner ear, known as proprioceptors.

(4) **Blurred** vision or **blindness** results from the action of the venom on the optic nerves.

TABLE I. ACTION OF SUBSTANCES IN SNAKE VENOMS *

Substance	Major effect(s)	Elapidae Hydrophidae	Viperidae Crotalidae
Thrombase	Action mainly local at the site of the bite, causing local thrombosis, gangrene, and, if injected intravenously, causes intra-vascula clotting.	Absent	Moderate.
Hemorrhagin	Lysis of cells of the capillaries causing hemorrhage in skin and mucous membranes (such as the gums, nail beds, intestinal tract, etc.). Action at first local then generalized. Convulsions, due to small hemorrhages in the brain (i.e., the cerebral cortex) sometimes occurs.	Absent or in small amount.	Predominate.
Anticoagulin	Proteolytic action in fibrin ferment	Absent	Moderate.
Neurotoxin	Paralytic effect on the respiratory center and the 9th, 10th, 11th, and 12th cranial nerves. Symptoms resemble acute glossopharyngeal paralysis. Produces a curarelike action in motor nerve and plates.	Predominate.	Absent or in small amount.

*This table does not include the action of venom from species of *Colubridae* (Opisthoglypha) but this kind of venom is believed to produce symptoms similar to that of *Viperidae.*

(5) **Hearing difficulty** sometimes develops from the action of the venom on the auditory nervous tissue.

(6) **Mental disturbances,** such as incoherent speech, stupor, mental confusion and possibly unconsciousness, are some of the usual manifestations when the gray matter of the brain is affected by the venom.

(7) **Locomotor disturbances** in accomplishing tasks requiring muscular coordination, e.g., reaching for some object or moving from place to place.

(8) **Muscle spasms or twitching.**

(9) **Respiratory difficulties,** such as irregular or labored breathing and/or shortness of breath, are the usual result of neurotoxin. In severe cases, respiratory paralysis may develop.

(10) **Irregularities of the skin,** such as tingling, numbness of the lips and soles of the feet, and excessive perspiration, in addition to excessive salivation (drooling) occur when the venom affects the nerves of the skin.

(11) **Temperature abnormalities,** fever and/or chills, may follow action of the venom on that part of the brain which regulates body temperature.

(12) **Digestive tract disorders,** nausea, vomiting and diarrhea, may occur. It should be remembered that not all the above symptoms necessarily develop at the same time. Cases occur in which only a few of these symptoms are detected; however, it is possible for all symptoms to occur. Fatal cases or particularly severe cases are especially liable to present all symptoms listed. The development of symptoms depends on the distribution of the venom in the body. Also, the effectiveness of first aid measures may be evaluated by the lack of development of such symptoms when the bite is known to have been from a species whose venom is neurotoxic and the quantity injected is believed to have been substantial.

b. When the venom received by the victim is primarily **hemotoxic,** the symptoms that occur are:

(1) **Tissue swelling at the site of the bite,** gradually spreading to surrounding parts of the body. Swelling occurs anytime from 3 to 5 minutes to an hour (rarely) following the bite. Excruciatingly painful, the swelling, in some cases, may become so severe as to burst the skin. **Note that swelling at the site of the bite and extreme pain are not characteristic of neurotoxic venoms.** The occurrence of deep pain in the absence of swelling indicates neurotoxic venom (e.g., U.S. coral snake venoms or venom from sea snakes in many parts of the world). The venom of the pit vipers typically produces swelling within a few minutes and is extremely painful.

(2) **Extravasation of blood** (i.e., the passing of blood into surrounding tissue after the rupture of a blood vessel), escaping from capillaries whose walls are destroyed by the action of the cytolytic (hemorrhagin) content of the venom. This effect may cause the development

of throbbing pain when swelling occurs as a result of the accumulation of blood in the tissues.

(3) **Destruction of blood cells** and other tissue cells resulting in pathological (abnormal) changes due to acute tissue anoxia (lack of oxygen).

(4) **Bleeding** from some of the major internal organs into the digestive and excretory tracts or into the great visceral (abdominal) space. This action of the anticoagulin component of the venom causes blood to appear in the urine and/or stool, bleeding from the lips, gums, nails, and oozing at the site of the bite.

(5) **Severe headache** may follow internal bleeding, and **thirst** usually occurs as a result of the decreased blood volume.

The venoms of almost all snakes produce varying degrees and combinations of the symptoms set for the above. The incidence of the various symptoms varies according to the species of snake.

It cannot be over emphasized that if the victim is subject to hypertension, excitability, nervousness or fearfulness, the symptoms are likely to be increased in severity and recovery from snake bite delayed.

4. EXAMINATION OF POSSIBLE VICTIMS

The following guidelines will aid lay personnel in accurately identifying victims of snake bites:

(a) **Look for the site of the bite.** While the bite pattern is not a reliable characteristic for identifying the species involved, the presence of one or two fang punctures and possibly other teeth marks, generally confirms the possibility of snakebite, particularly when bolstered by the presence of other symptoms.

Sea snakebite is easily overlooked and produces a misleading delay in the development of observable symptoms. See Chapter IV, para. 4.

(b) **Pain at the site of the bite.** When present, pain is a reliable indication, in the presence of fang marks, that the victim was bitten by a poisonous species. Thus, if the victim does not develop pain at the site of the bite (with or without swelling), it is presumed to have been inflicted by a non-poisonous species **provided other symptoms have not and do not develop.**

(c) **Swelling.** This is a reliable indication of poisonous snakebite by a member of the viper or pit viper families (*Viperidae* and *Crotalidae*) when it develops at the site of fang punctures within an hour of the bite.

(d) **Weakness, giddiness, paralysis, twitching and numbness.** These are all characteristics of neurotoxic venom, but care must always be taken to distinguish fear-induced from venom-induced symptoms. Thus they are not completely reliable signs of snake envenomation. Nevertheless, it is best to assume that these symptoms are indications of snakebite and to institute proper first aid without further delay.

CHAPTER IV

What To Do in Case of Snakebite (First Aid)

1. BACKGROUND

First aid in the case of snakebite, as in other forms of medical emergencies, can be and usually is life saving, when performed promptly and efficiently. Many people bitten by snakes become excited, hysterical and panicky whether the bite be inflicted by a harmless or venomous species. Symptoms which are the direct result of fright, pain, and other kindred emotions may become serious enough to have tragic results. However, very few victims die or become permanently disabled as a result of snakebite when first aid is administered promptly and properly.

Snakebite may occur when the victim is alone or with companions and, in the Navy and Marine Corps, first aid may of necessity be administered by non-medical personnel and hospital corpsmen, as well as doctors. Guidance is given herein for use under each of these circumstances. Definitive treatment of snakebite to be administered by doctors is treated fully in Chapter V.

2. FIRST AID PROCEDURES (GENERAL)

The following procedures, given in general order of performance, are to be continued until (1) the poisonous or non-poisonous nature of the snake in question is definitely established and, if poisonous, the pain and/or swelling have subsided or stopped spreading, or (2) responsibility for treatment has been transferred to a physician.

STEP 1. KILL THE SNAKE immediately and keep it. Its identity is necessary before specific antivenom treatment can be given. Most snakes can be killed with one sharp blow on the head. Do not spend more than a few moments in this activity nor move more than a few feet from the place where the bite occurs.

STEP 2. LOOK FOR FANGS unless the snake is immediately positively recognized as a poisonous species—in which case omit this step. Again, it is important to remember not to spend more than a few moments in this activity. Always use a stick or other instrument in examining the snake's mouth for the presence of fangs.

STEP 3. LIE DOWN ON THE SPOT, if the snake is definitely identified as a poisonous species or is unidentified. If the snake is positively identified as a non-poisonous species cleanse the wound with an antiseptic and report to a doctor as soon as possible.

STEP 4. ACHIEVE IMMEDIATE AND ABSOLUTE IMMOBILIZATION OF THE BITTEN PART IN A POSITION BELOW THE LEVEL OF THE HEART. There is seldom any difficulty in locating the site of the bite (indicated by pain and/or by 1 or 2 reddish or purplish spots about half an inch apart). In case of doubt, remain quiet and proceed to step 5 in either case. It is very important to keep body metabolism at a minimum. The victim should be kept dry and warm and not allowed to walk around. Any manifestation of fear or emotional excitement should promptly be counteracted, if possible, by reassuring victims that few fatalities occur and by conducting intelligent first aid in a confident manner. NEVER give alcohol to victims of snakebite.

STEP 5. IN CASE OF BITES ON AN EXTREMITY (HANDS, ARMS, LEGS AND FEET), PLACE AN IMPROVISED LIGHTLY CONSTRICTING BAND OR TOURNIQUET TWO TO FOUR INCHES CLOSER TO THE

HEART THAN THE SITE OF THE BITE and reapply the band ahead of the swelling if it progresses up the arm or leg. The constricting band should be placed tightly enough to stop the flow of blood in the superficial blood vessels but not tightly enough to stop the pulse (arterial flow).

EXCEPTION: If the bite occurs in Africa, India, Burma, Thailand or Australia (countries in which neurotoxic snakebites are most prevalent) or the snake is positively identified or recognized as a snake possessing neurotoxic venom, the tourniquet should be tight enough to restrict arterial flow. Such tourniquets should be placed on the upper arm or upper legs (single-boned limbs). Complete cessation of blood circulation must be achieved because neurotoxin is absorbed or diffused rapidly. Every minute's delay in stopping circulation, increases the chance of absorption of a lethal amount of venom. **Be sure to release the tourniquet for 30 seconds every 20 minutes** to allow fresh blood to enter the bitten part.

STEP 6. IN CASE OF RESPIRATORY FAILURE (A NEUROTOXIC EFFECT), PROLONGED MOUTH-TO-MOUTH OR MOUTH-TO-NOSE ARTIFICIAL RESPIRATION SHOULD BE INSTITUTED. A period of two hours is not too long, if necessary (i.e., unless the victim revives) to continue artificial respiration. There are many cases on record where patients have been cured after they had sunk into a coma, but were revived and kept alive by artificial respiration long enough to allow a delayed injection of antivenom to come in contact with and neutralize a major portion of the venom. In this type of poisoning the heart may continue to beat 15 or 20 minutes after respiration has ceased. Thus, it is important to be alert to respiratory failure. Try to keep the victim awake until the antivenom has been injected and commences to relieve the symptoms.

STEP 7. OBTAIN ASSISTANCE FROM THE NEAREST MEDICAL SOURCE AT THE EARLIEST POSSIBLE MOMENT. Transportation of the patient should be by litter if it becomes necessary to move him. In case the victim has two companions, one should immediately go in search for a doctor as soon as it has been determined that the bite was from a poisonous species and poisoning is likely.

STEP 8. INCISION AND SUCTION SHOULD BE INSTITUTED AS SOON AS POSSIBLE, PREFERABLY WITHIN 10 MINUTES BUT NOT AFTER ONE HOUR FOLLOWING THE BITE. Hospital corpsmen should perform this step only when the services of a doctor will be unavailable for more than an hour. Non-medical personnel should perform this procedure only (1) when the services of a doctor or hospital corpsman cannot be obtained within an hour; (2) when the snake is positively identified or recognized as a deadly poisonous species and/or swelling, pain or other symptoms of snakebite as listed previously have developed and (3) after sterilizing a sharp instrument with which to perform the incision. Incisions must not be more than half an inch in length, should be made through the skin over the site of the bite mark(s) parallel to the longitudinal line of the extremity and not more than ¼ inch deep. The incisions must penetrate through the skin but should not be deep enough to enter muscles or to injure underlying structures, such as tendons, blood vessels or nerves. Suction may be performed by suction cups, if available, or by mouth and continued for at least 30 minutes. The purpose of this step is to remove as much venom as possible prior to its combination with underlying tissues. Thus, the sooner it is instituted, the more chance there is for removing significant amounts of venom. Non-medical personnel should never make incisions on the fingers, hands, wrist, toes, feet or ankles unless the part is swollen to a point that such incisions cannot damage underlying structures.

STEP 9. ADMINISTER ANTIVENOM AS SOON AS POSSIBLE. Hospital corpsmen and other medical department personnel, after suitable training, may, ONLY IN THE ABSENCE OF A DOCTOR, administer appropriate antivenom when it is available. However, when an undoubted effective bite by a dangerous species has occurred in a region remote from medical aid, antivenom should be administered by other personnel. Except in the latter instance, however, non-medical personnel should never attempt to give antivenom.

Before any personnel proceed to give antivenom it is necessary to conduct a sensitivity test. Follow the instructions given below as carefully as possible:

(1) Using a tuberculin syringe (1.0 ml.) with a sterile needle, withdraw 0.1 ml. of the antivenom from its container. Prepare another syringe containing 0.5 ml. of adrenalin (1 in 1000). Keeping the latter syringe sterile and handy, proceed to

(2) Inject 0.1 ml. antivenom subcutaneously (just below the skin) and observe the victim for 15 minutes for allergic symptoms (such as itching, excessive sweating, swelling and redness at the site of the injection, etc.). Symptoms occurring later than 15 minutes after the administration of antivenom are more likely to be due to the snakebite than to the antivenom.

(3) If allergic symptoms occur, or if the patient is known to be allergic to horse serum or has a history of receiving horse serum injection previously inject 0.3–0.5 ml. of adrenalin subcutaneously and observe the patient for an additional 15 minutes. SINCE SHOCK FROM THE HORSE SERUM CONTAINED IN THE ANTIVENOM MAY ENSUE, BE PREPARED TO ADMINISTER ARTIFICIAL RESPIRATION. Some people experience unpleasant reactions to the adrenalin but these symptoms usually disappear within 10 to 15 minutes after the injection.

(4) If the victim exhibits allergic symptoms, after the injection of adrenalin, administer the antivenom only when the snake is known to be a dangerous species and an effective bite has occurred. Antivenom should be given only by the intramuscular route, should be given in divided doses very slowly and should be stopped immediately when any sign of anaphylaxis (serum sickness) develops.

(5) If the victim shows no sign of allergic reaction within the observation period, administer the antivenom in one dose at a site other than that surrounding the bite.

3. SNAKE VENOM CONJUNCTIVITIS

At least two species of African snakes (i.e., the black-necked or spitting cobra, *Naja nigricollis* and the "ringhals", *Hemachates haemachatus*) have developed the defensive act of ejecting their venom in a stream or fine spray for the surprising distance of up to 8–12 feet. The accuracy of the delivery is remarkable and is usually directed towards the eyes. The venom causes intense pain, temporary blindness and allows the snake to escape. Serious impairment or possibly blindness may result from the untreated case. IMMEDIATE flushing with copious amounts of water or other fluids available (milk, weak boric acid solution, etc.) is the proper field first aid treatment of such casualties. The inflammation of the eyes subsides in a few days following such treatment. It is improbable that sufficient poison is absorbed in this manner to produce a fatal outcome; however, the decision as to whether antivenom should or should not be used must in all instances be reserved for a doctor.

4. SEA-SNAKE BITES

Sea-snake bites, while generally rare, may be encountered throughout the world, except on the coasts bordering the Atlantic Ocean. They are less prevalent, the world over, than accidental drownings. Sea-snakes have never been observed to attack human beings spontaneously; however, the venom is particularly toxic, possessing a potent neurotoxin. Only about 1 case in 4 actually bitten by sea-snakes receive sufficient venom to develop symptoms.

First aid is ordinarily not possible because the bite is painless (after the initial prick), does not swell and by the time symptoms develop, first aid measures can serve no useful purpose. However, sea-snake poisoning should be considered a possibility when persons, who have been in coastal (particularly estuary) waters within the past hour, complain of muscle aches, pains and stiffness of movement. The diagnosis becomes more positive when, after 1–2 hours following the bite examination reveals moderate to severe pains on passive movement of the arm, thigh, neck or trunk muscles. Myoglobinuria, evidenced by a red-brown color of urine develops in 3–6 hours following the bite. The delay between the bite and the development of symptoms may in rare cases, be as long as 6 hours. A delay of longer duration completely excludes the possibility of sea-snake bite. Also, swelling and/or pain at the site of the bite within an hour eliminates sea-snake bite as a possibility. It is probably a fish sting. Victims of sea-snake bites should be immediately and completely immobilized, made to drink one liter (a quart) of water and transported **by litter** to the nearest doctor. Respiratory failure may be a symptom in persons severely poisoned by sea-snake venom. Be prepared to administer mouth-to-mouth or mouth-to-nose artificial respiration.

The Commonwealth Serum Laboratories of Melbourne, Australia, have developed an effective antivenom against certain of the most common sea-snakes. Reportedly available in the Spring of 1962, such antivenom should be used when obtainable so long as the symptoms of the bite persist.

5. SELF FIRST AID FOR SNAKEBITES

The first and foremost point to keep in mind is that, although serious, snakebite poisoning is usually neither fatal nor permanently disabling. Remember that a person who becomes excited, nervous or frightened is severely handicapped. Follow the instructions given below carefully:

STEP 1. KILL THE SNAKE, if possible, and search for presence of fangs. **Do not spend more than a few moments in this activity.**

a. If the snake is positively recognized as poisonous or fangs are demonstrated, complete steps 2, 3, 5–B, 6–B, and 7–B.

b. If unable to kill the snake immediately or fangs are not immediately located, the poisonous nature of the snake is **uncertain**. Proceed to

STEP 2. LIE DOWN AT ONCE; apply a tourniquet 2–4 inches above site of the bite; suck the wound.

STEP 3. REMAIN AS QUIET AS POSSIBLE; keep bite site completely immobile and lower than the rest of body (below the level of the heart).

STEP 4. REST FOR 15 MINUTES WITH THE TOURNIQUET IN PLACE. Then proceed as follows:

STEP 5–A - - - - - - - -	OR	- - - - - - - - STEP 5–B
If no significant swelling, pain, tingling or numbness of the scalp, feet, lips or tongue have developed: (a) assume the snake was nonpoisonous and (b) walk **slowly** toward the nearest habitation or medical aid.		If significant pain, swelling, numbness, tingling or continued oozing of blood develop at the bite site: (a) assume the snake was venomous and (b) lie quietly and perform incision and suction (see Step 8, page 8).
STEP 6–A Victim will now (a) be certain that the bite was from a harmless snake or (b) remain uncertain.		STEP 6–B Remain quiet and maintain immobilization of bitten part until help arrives or until the worst effects are over. If it appears likely that a long, uncomfortable wait will ensue and, if a **known** habitation is reasonably nearby, victim should **slowly** walk towards the shelter with **minimum** exertion. *CAUTION:* **Never** attempt to walk unless it is evident that failure to do so would jeopardize survival more than the poison itself.
STEP 7–A If step 6–A (b) is so, victim should be transported to a doctor, if necessary, or remain in doctor's care for observation and treatment (see Chapter V). **Victims should not walk unless other factors jeopardize survival more than snakebite**, and transportation of any kind is not available.		STEP 7–B Victim should try to attract attention of any passersby, or planes, or boats by flares, gunshots, smoky fires, flashlights, etc. Any help attracted will notify nearest doctor immediately.

If the victim has a companion, that person should perform the necessary first aid procedures and **stay with him** until he can be delivered to a doctor. If two or more companions accompany the victim, at least one such person should be sent in search of a doctor immediately after it is determined that the snake is venomous and poisoning is likely to have occurred. A hospital corpsman, if available, should take control of the first aid procedures.

6. WHAT NOT TO DO

a. Remember that a person given to hypertension, excitability, nervousness or frightfulness is severely handicapped and not likely to recover rapidly from snakebite. NEVER GET EXCITED OR FEARFUL.

b. NEVER give the victim alcoholic beverages—it speeds up metabolism and in the case of viper bites, is likely to be fatal.

c. Do NOT put chemicals or substances other than antiseptics in or on the bite wound(s). They are likely to be more harmful than beneficial.

d. Morphine is CONTRAINDICATED when venom contains a neurotoxin because the immediate threat to life is respiratory failure.

e. Do NOT attempt to refrigerate the area surrounding the bite by using some drastic measure like ethyl chloride spray. Ice or ice water packs are of no proven value and may do considerable damage.

f. Do NOT kill snakes indiscriminately. Kill them only for identification purposes. Never smash the head beyond recognition. Most snakes can be killed by one sharp blow on the head.

g. NEVER manipulate the head of a poisonous snake with one's hands. It may still inflict a dangerous wound by reflex action. Always use a stick or other device for this purpose.

h. NEVER pick up a snake unless it is necessary, or without knowing for sure that it is a non-poisonous variety.

CHAPTER V

Treatment of Snakebite

1. INTRODUCTION

The treatment of snakebite and snakebite envenomation has been subject to controversy among experienced physicians. Included herein are regimens for treatment in various parts of the world. While local treatment is left to the discretion of the physician in charge, the official policy of the Bureau of Medicine and Surgery should be followed in the absence of valid circumstances justifying modification.

The treatments set forth herein are meant for the exclusive use of qualified physicians and, except in specified instances, non-physician personnel should not attempt to administer such treatment.

2. BACKGROUND

Much of the literature extant, at the time this study was made, was based on animal data. Valid comparative data on results of these various methods in man are not available. Therefore, the policy set forth herein by the Bureau of Medicine and Surgery should be considered temporary pending the development of improved methods following further research.

3. GENERAL REVIEW OF TREATMENT

The literature reveals considerable controversy over the therapeutic value of various more or less classical methods such as incision or excision and suction, use of a tourniquet, hypothermia, antibiotics, antihistamines, corticosteroids, hyaluronidase and even antivenoms.

Keegan (1958)[1] refers to Efrati and Reif's[2] arguments against the standard methods in use in 1953. These Israeli physicians were convinced that the use of a tourniquet did not help the patient, that excision of the bitten part was impracticable unless done immediately, and that incision and suction were of little value. They made the following recommendations after studying 65 cases of viper bite (mostly from bites by *Vipera xanthina palaestinae*):

a. First and foremost—absolute immobilization of the bitten part, by splint if possible.

b. Use antivenom—if specific antivenom is available.

c. Watch for shock—saline, plasma, and blood may be needed.

They also felt that the use of antihistamines might be helpful; however, their experience was meager at the time.

Theodor[3] (1955) reported that "AO" (against venoms of West African snakes, mainly *Bitis* and *Hemachates*) and "AN" (against venoms of North African snakes, mainly *Aspis cerastes* and *A. vipera*) antivenoms manufactured by the Institute Pasteur in Paris, have very little neutralizing effect against *Vipera xanthina palaestinae* venom. However, the "ER" (against *V. aspis* and *V. berus*) antivenom partially neutralizes it. This author recommended a light ligature and deep incisions followed by immobilization by split and cold compresses to slow down reabsorption and lymph flow. He emphasized the importance of the use of specific antivenom (given subcutaneously or intramuscularly in the neighborhood of the bite) and stipulated that the next most important measures are transfusions of blood, saline or glucose to make up for the loss of fluid and for treatment of the severe anemia which develops following the bite.

Theodor[3] discussed the clinical picture resulting from the bite of the Palestine viper (*V. xanthina palaestinae*). Among the more prominent symptoms, as he described them, was lytic action on the capillary walls, which become permeable. First plasma and later blood escapes into the tissues, resulting in edema and the development of **phylyctenae** (blisters filled with serous fluid and many contain fluid blood). Fibrinolysis may also occur. Efrati and Reif[2] (1953) reported that the blood of a person bitten by *V.x. palaestinae,* left at room temperature for 45–60 minutes became fluid again. However, the clotting time remained normal and the clotting of the blood was unaffected. Nausea, vomiting, abdominal pain and diarrhea, not unlike that observed in cholera cases, develop in 20–30 minutes following the bite. A severe form of peripheral shock develops and systolic blood pressure falls to less than 80 mm. of mercury during the first hour. Pulse becomes gradually more shallow and rapid and may become undetectable.

A review of local measures of treating snakebite envenomation appearing in the *Journal of the Indian Medical Association,* 1 March 1960,[4] concluded that such measures as ligature, incidion and suction, and venesection were useless in cobra bites but extremely beneficial in a "daboia" (*Vipera russelli*—Russell's viper) bites. Use of chemicals like potassium permanganate and other oxidizing agents were harmful in that they cause extensive necrosis while, in some cases, destroying the poison. They highly recommend limb immobilization and use of specific antivenom.

Gupta, P. S. *et al*[5] (1960) reviewed 200 cases of snakebite in India occurring over a period of 6 years and presented data indicating that, in those cases receiving corticosteroids (cortisone, 50–100 mg., intramuscularly, 8 hourly or prednisolone, 5–10 mg., 6–8 hourly) in addition to polyvalent antivenom, control of bleeding, edema, fever and pain were faster than in those receiving the antivenom alone. Another reported advantage was the absence of allergic reaction in cases given repeated doses of antivenoms. In their cases the most frequently reported signs and symptoms of snakebite (cobras, kraits, Russell's viper and *Echis carinatus*) were, in order of prevalence: fever, 45%; local pain, 20%; bleeding diathesis, 17.5%; and edema or cellulitis, 13%. Most cases were bitten, in order of prevalence, on the foot, toes, hands and fingers, and the greatest majority of cases occurred in August (54), September (34), July (31), October (17), and April (16).

P. J. Deoras[6] (1959) of the Haffkine Institute in Bombay suggested ligation, incision and suction followed by specific or polyvalent antivenom and emphasized that cauterization of the wound or placing strong chemicals, such as potassium permanganate, in the wound were dangerous and ineffective procedures. He also recommended that the subcutaneous or intramuscular dose should be 2–3 times that specified for intravenous use. Emphasis is placed on the precaution of determining the victim's sensitivity to horse serum as indicated by the intradermal or ophthalmic test. The intradermal test is performed by injecting intracutaneously 0.05–0.1 ml. of 1–10 dilution of antivenom into the flexor surface of the forearm. A positive result would be indicated by rapid enlargement of the primary elevation, urticaria and a zone of erythema in 5–20 minutes. Pseudopodial extensions of the erythematous wheal is evidence of a dangerous degree of sensitivity. The ophthalmic test is performed by placing 1 drop of undiluted antivenom into the conjunctival sac. A positive reaction is indicated by itching, burning, lacrymation and congestion in about 5–25 minutes. A drop of 1–1000 adrenalin chloride will relieve symptoms and should be used in every positive case. A dangerous degree of sensitivity is indicated by a positive ophthalmic test.

A positive result of the above tests indicates that desensitization should be performed. In severe cases, 0.1 ml. of antivenom is injected subcutaneously and the dose doubled every ½ hour until the full amount has been administered. Subsequent doses may then be given in full amounts by any route, but it must be remembered that such patients again become sensitive in a few weeks. Adrenalin chloride 1–1000 should be given at the first sign of anaphylaxis (0.5–1.0 ml. subcutaneously). A tourniquet should be applied proximal to point of injection and antivenom administration ceased immediately. Give adrenalin at frequent intervals until acute symptoms are under control, after which sedation may be given. Sedatives and stimulants, like morphine and strychnine, may be used with extreme care in cobra and krait poisoning. In all severely poisoned persons great relief is likely to occur as a result of blood transfusions or physiological saline. The latter procedures may be life saving in border-line cases.

Benyajati et al.[7] (1961) reported 6 cases of cobra bite treated by intravenous injection of a glucocorticoid hormone with beneficial results and no side reactions but the mechanism or mode of action of these drugs remains unknown. The same authors[8] (1960) reported that cortisone in addition to specific antivenom was introduced to obviate the risk of serum sickness and anaphylactic shock. The dosage used in the 60 cases of viper bites, upon which the latter report is based, was 300 mg. cortisone acetate per day either oral or intramuscularly. There seemed to be no risk of anaphylaxis or serum sickness when cortisone was used. British authorities[9] (1960) recommended immobilization and Pasteur Institute "ER" serum in cases of bites by *Vipera berus* and *Vipera aspis* and referred to tourniquets and incisions and suction as "old fashioned tissue damaging measures."

Birch[10] (1959) reported that adder bites in Great Britain (where *Vipera berus*, the only important poisonous snake in the country, is common, particularly in New Forest and Dartmoor) are usually not serious and that antivenom should be reserved for cases with serious symptoms because the antivenom itself may cause dangerous symptoms. Therefore, he suggests that it is wise to start giving the antivenom by injecting 0.2 ml. intramuscularly and waiting for 30 minutes (in the case of a non-allergic patient with serious symptoms). If the patient is known to be allergic, this step should be preceded by injecting 0.2 ml. of a 1 to 10 dilution of the antivenom with a waiting period of 30 minutes. Adrenalin (1–1000) should be available during this period. Birch also suggested that the intravenous route can be avoided and antivenom absorption will be more rapid, if 1500 international units of hyaluronidase are given with the antivenom. Tetanus antitoxin (3000 units) administration was recommended unless the patient had been previously immunized.

Ahuja and Singh[11] (1956) indicate that the lessened coagulability of the blood is a useful aid in differentiating the bites of deadly poisonous snakes from harmless species in India, providing neurotoxic symptoms are not observed. They report that viper bites can be ruled out if the blood coagulates within 10 minutes when the victim is first seen later than 30 minutes following the bite. *Bungarus coeruleus* (a krait) and the viper, *Echis carinatus* (saw scaled viper), produced the highest death rates from snake bite in India (77.1% and 32.8%, respectively), but the largest number of cases, in which the species is identified, is caused by the cobra, *N. naja*. See Chapter VIII for snakebite statistics produced by these and other species.

Wig and Vaish[12] estimated that not less than 20,000 to 25,000 persons die annually from snake bite in India, and that most of the deaths are due to bites of the following varieties:

Elapidae–Bungarus (kraits), *Naja* (cobras)
Viperidae–Vipera (Russell's viper), *Echis* (saw scaled viper)

In a small series of cases, these authors were impressed with the use of corticosteroids hormones (cortisone, 100–200 mg./day; prednisolone, 30–40 mg./day) and believed that such routine treatment was responsible for the 100% recovery among their patients. They suggested that the antivenom administered (10–20 ml. bivalent Kasauli Research Institute antivenom *versus* cobra and Russell's vipervenom) played a doubtful role inasmuch as it was not specific for *Echis carinatus* (the saw scaled viper), probably the snake responsible for the majority of their cases.

Corkhill[13] (1959) presented a good general review of the problem of snakebite treatment in the tropics, pointing out that the over-all mortality from snakebite was about 8%. In most places, except Burma and India, where kraits (*Bungarus sp.*) cause considerable mortality, the majority of those bitten recover. He pointed out that the severity of the poisoning clearly depends on the amount of venom injected per unit of body weight. However, this factor is never quite precisely known, since the amount of venom injected will vary according to whether one or both fangs entered the tissue, whether the bite was mechanically efficient, and the amount of venom in the snakes' glands. He noted that the saw scaled or carpet viper (*E. carinatus*) of India and possibly the mole vipers of Africa (*Atractaspis sp.*) bite more efficiently at night.

Dr. Corkhill also explained that dilation or contraction of the pupils is associated with krait poisoning in India and that, while the presence of erythrocytes in the urine is considered presumptive evidence of envenomation following a bite, due regard must be given to other causes particularly in bilharzial areas. However, if an increase is noted in 4-hour urine specimens, even in bilharzial areas, this may be the earliest confirmation of envenomation and strongly supports a positive diagnosis. He recommends morphine, pethidine or "pethilforan" (Roche) or similar drugs for pain. However, morphine is contraindicated in neurotoxic envenomation. Procaine may be used locally. On the basis that hemorrhagin in snake venom and vitamin C deficiency are synergistic, he suggests that it is rational to administer intravenous ascorbic acid. Also, he doubts that use of a tourniquet, incision, excision, or amputation have the slightest value after the expiration of 2 to 10 minutes following the bite, certainly in proteolytic envenomation, although they may have some value in neurotoxic envenomation. Fixation of neurotoxin does not seem to be entirely irreversible. The massive destruction of cells and endothelium due to proteolytic enzymes is obviously irreversible.

Finally, Dr. Corkhill points out that there is a most deceptive symptomless delay (up to 11 hours) following krait bites before the onset of rapidly serious poisoning; that a good prognosis in viper poisoning is supported by progressive decrease in hematuria and a trend to the 3-minute level of clotting time; and that in *Elapidae* bites, every hour that passes is to the good, and usually those who will recover do so within a day.

The Norwegian Medical Association [14] (1961) recommended the following treatment for adder bites (*Vipera berus*):

a. Immobilize bitten part.
b. When bite is fresh start blood flow by simultaneous incisions (subject to heated discussion but still recommended).
c. Inject: 10 ml. Viper serum around bite. Test dose of 0.2 ml. is injected with a wait of ½ hour. Look out for possible anaphylactic shock.
d. Give 20–40 ml. intramuscularly as soon as general symptoms set in.
e. Give 20–40 ml. intravenously at pronounced general symptoms.
f. Recommend cortisone (4–25 mg. amounts) administered perorally or intramuscularly. As much as 150 mg. has been used.
g. Shock Therapy: Blood transfusion, cortisone, as well as general treatment for shock is used. Norepinephrin may be given intravenously or Aramine intramuscularly.
h. Antibiotics are administered to prevent subsequent complication.
i. It is pointed out that alcoholic beverages are contraindicated.

Imamaliev [15] (1958) provided a review of treatment of *Vipera lebetina* bites in Southern Russia. Only 2 deaths occurred among the 83 patients seen by this author. The serious cases were characterized by hemorrhagic swellings, vesica in various numbers containing serous, pyo-serous, or bloody fluid, gangrenous complications developed in the area of the bite and lymphangitis and lymphadenitis occurred. An unhealing ulcer at the site of the bite is present for a long time. In some patients the body temperature may reach 39°C. or higher. There is strong nausea and vomiting, weakness, chills, head and body aches and pains, syncopal condition and a higher pulse rate. Average length of hospitalization of such patients was 23–25 days.

Treatment prior to admission included the use of a tourniquet and incision and suction.

However, he states that a detailed study of the use of the tourniquet showed the futility of its use. The clinical treatment of such cases was more complicated than cases where it had not been used. In some cases the tourniquet definitely caused complication. This author also sees no necessity of making incisions since it does not preclude infection. He recommends, as most effective, the use of an "anti-snake" serum called "antigyurza." This product is presumably an antivenom *versus* venom from *V. lebetina.* He does not specify how it is manufactured.

The dose of antivenom used is determined by the seriousness of the case using greater amounts in the more serious cases. In a moderate case, 20–30 ml. antivenom injected intramuscularly is used. When the case is serious 30–50 ml. is used, repeating the injection up to 3 times. If this is still insufficient to allay the symptoms, an intravenous injection of 20–30 ml. is made. He considers it necessary to administer antivenom to all snakebite victims regardless of the time of admission or the course of the clinical treatment. An early administration assures the best and quickest positive results.

The data shown in this report clearly shows a significant difference in terms of days of hospitalization when patients upon whom a tourniquet was used are compared to those cases where the tourniquet was not used. Thus, 38 patients, of the total of 81 treated, spent an average of 18.6 days hospitalized after a tourniquet had been used. The remaining 43 patients spent an average hospitalization period of 8 days. A tourniquet was not used in the latter cases.

Purananda [16] (1956) regarded the use of specific antivenom as the only reliable method of treatment of snakebite in Thailand.

The Thai Red Cross Society [17] (1959) recommends the following courses of action in case of envenomation by the indicated poisonous species in Thailand.

Since specific antivenom is available from the Queen Saovabha Memorial Institute, polyvalent antiserum should not be used because this would unduly expose the victim to serum sickness. Snakebite can be diagnosed by these signs and symptoms:

a. **Cobra Bite** (*Naja naja*) is indicated by moderate pain, slight swelling and numbness of the bite area. Within about 10 minutes the victim will experience dizziness, drooping of eyelids, inability to open eyes, stiffness of jaws and difficulty in swallowing with dyspnea. Eventually coma sets in, pulse becomes weak and patient may expire in respiratory or cardiac failure, unless treated. Use specific antivenom as soon as possible and until patient is relieved of general symptoms. Keep a syringe of adrenalin (1–1000) handy to combat shock. After relief, patient should be observed for ½ hour until sure no recurrence of general symptoms will occur. The local symptoms around the bite may linger for a day or two.

b. **King Cobra Bite** (*Naja hannah*) symptoms are the same as cobra bites but develop more rapidly because of the larger amount of venom injected. The treatment is the same as for cobra but use specific King Cobra antivenom.

c. **Russell's Viper Bite** (*Vipera russelli*) is indicated by pain, swelling and petechial hemorrhage. A few minutes later general symptoms occur: epistaxis, bleeding from gums, hemorrhage under skin and mucous membranes and later in urine, feces, and vomitus. Coma occurs in untreated severe cases and the victim dies in circulatory failure. Give antivenom until bleeding stops and replace lost blood by glucose saline solution or by blood transfusion in severe cases. Keep patient under observation at rest for 1–2 days before release.

d. **Banded Krait Bite** (*Bungarus fasciatus*) is differentiated from sea-snake bites (which it resembles) by the location in which the bite took place. Krait bite will occur only on land or in fresh water. Symptoms will be a combination of cobra and Russell's viper bite symptoms with very severe tenderness all over the body. Give antivenom intramuscularly or subcutaneously. Victim should be kept warm and in a place where hypodermoclysis or blood transfusion can be easily administered. Symptomatic treatment for pain and tenderness should be prescribed. Treatment will take at least a week with strictly close observation.

e. **Agkistrodon rhodostoma** bites usually occur in a shady area such as the seaside or a mining area. Pain, local swelling with petechial hemorrhage develop at the bite site which later on will form a clot. Dry gangrene will develop in an untreated case and, if infected this will turn into wet gangrene, resulting in the loss of limb or life. Administer specific antivenom intramuscularly or subcutaneously and also around the site of the bite. Such cases are rarely fatal except when wet gangrene sets in.

In cases of non-deadly poisonous snakebites the symptoms may be marked by pain, swelling and sometimes hemorrhage at the site of the bite but without general symptoms. In such cases antivenom should not be used and symptomatic treatment consisting of sedation for pain and fomentation for swelling should be administered. Sea snakebites should be treated with antivenom obtained from the Commonwealth Serum Laboratories in Melbourne, Australia. Immediate and absolute immobilization is the only other effective measure. Consult chapter IV for symptoms of sea snakebite.

Keegan [1] (1958) reported studies which had been conducted at the University of Tokyo, the 406th Medical General Laboratory and Wyeth Laboratories, in 1956 and 1957, designed to determine the effectiveness of the Wyeth polyvalent antivenom in neutralizing venoms from snakes in the Asian area. This product was shown to give excellent neutralization of venom from the following species:

Trimeresures flavoviridis—The Okinawan habu
Trimeresurus mucrosquamatus—The Taiwan habu
Trimerisurus gramineus—The green tree viper
Agkistrodon acutus—The hundred-pace snake

An antivenom manufactured by the Institute for Infectious Diseases of the University of Tokyo was shown to be many times more potent than the Wyeth product in neutralizing venom from *T. flavoviridis*, the Okinawan habu.

Regarding snakebite in Australia and adjacent islands having the same species of poisonous snakes, the Commonwealth Serum Laboratories [18] recommend the following treatment procedures:

a. Apply a tourniquet on a single-boned limb in such a way as to cause complete cessation of circulation. The neurotoxin of Australian snakes is rapidly diffusable. Loosen the tourniquet every 20 minutes for 30 seconds and remove it shortly after administration of antivenom.

b. After applying the tourniquet (or if it cannot be applied because of the location of the bite) wash thoroughly the surface of the bite. If water is not available, saliva or urine may be used instead.

c. Incision is useful only within a few minutes following the bite and should extend down to the region in which the venom is believed to have been deposited. This permits suction and will cause bleeding if a tourniquet has not been applied. An alternative to incision is the local injection of 0.2 ml. of 5% potassium permanganate along the fang tracks into the place where the venom is deposited. This amount will not cause tissue necrosis.

d. Excision is not devoid of risk in unskilled hands and requires great courage to perform on one's self. It is useful only during the first few minutes after the bite. It consists of removal of skin and subcutaneous tissues over an area a little greater than a square inch surrounding and including the fang marks.

e. Local venesection may, perhaps with great advantage, be performed at any time up to two hours after the bite, provided a tourniquet has been applied. Otherwise, it is useful only within a few minutes following the bite. It is more efficient the earlier it is performed. It consists of placing a second tourniquet immediately distal to the first and tightening it just enough to obstruct the venous return. An incision is made into a vein draining the bite area and allowing a succession of small bleedings by lifting the arterial ligature for a minute or two while leaving the venous ligature in place. In an adult a pint to a pint and a half of blood can be removed.

The most prominent components of Australian snakes are given in the following table:

SPECIES	COMPONENT			
	Neurotoxin	Cytolysin	Hemolysin	Coagulant
Death Adder (*Acanthophis antarcticus*).	++++	++	+	......
Copperhead (*Denisonia superba*).	++++	++++	++++	......
Taipan (*Oxyuranus scutellatus*).	++++	++	+	++++
Brown Snakes (genus *Demansia*, and *Pseudechis australis*).	++++	++	+	++++
Black Snake (*Pseudechis porphyriacus*).	+	++++	++++	++++
Tiger Snake (*Notechis scutatus*).	++++	++	+	++++

It is difficult, if not impossible, to determine the species from the symptoms produced by the venom components listed in the above chart (a graphic representing the pharmacological action of the venom presented in written form by the Commonwealth Serum Laboratories in the technical brochure furnished with antivenom). In general, the symptoms commonly referred to each component are:

Neurotoxic Symptoms

(1) Gait incoordinated; patient walks like a drunk man.
(2) Sensation blunted and drowsiness increases.
(3) Pupils are dilated and fail to respond to light or accommodation.
(4) Bilateral ptosis is present.
(5) Tongue paresed and speech slurred and difficult.
(6) Soft palate may be paralyzed and swallowing difficult.
(7) Limbs are weak but not completely paralyzed.
(8) Respiration slow and coma and death supervene.

Cytolytic Symptoms (Peripheral Circulatory Failure).

(1) Prostration, vomiting.
(2) Skin blanched and sweats freely.
(3) Extremities are cold.
(4) Pulse is rapid and thready.
(5) Respirations frequent and shallow.
(6) Blood pressure is lowered.

Hemolytic Symptoms.

(1) Hematuria, hemoglobinuria or methemoglobinuria.
(2) Hemorrhage from mucuous membranes.

Coagulant Symptoms.

Such symptoms may be multiform. They are caused by thrombosis in various sites, such as the mesentery, and result in severe abdominal pain and the passage of bright red blood.

This laboratory manufactures antivenoms and offers the following advice regarding selection of the proper antivenom once the snake has been identified:

Snake	Appropriate Antivenom and Initial Dose		Alternate Antivenom	
	Dosage	Antivenom	Dosage	Antivenom
Tiger Snake	3000 Units	Tiger Snake Antivenom.	(None)	
Tasmanian Tiger Snake	6000 Units			
Chappel Island Tiger Snake	6000 Units			
Black Tiger Snake	12000 Units			
Death Adder	6000 Units	Death Adder Antivenom.	12000 Units	Tiger Snake Antivenom.
Taipan	12000 Units	Taipan Antivenom.	(Very large doses of Tiger Snake Antivenom.)	
Copperhead	3000 Units	Tiger Snake Antivenom.	(Very large doses of Tiger Snake Antivenom.)	

Snake	Appropriate Antivenom and Initial Dose		Alternate Antivenom	
	Dosage	Antivenom	Dosage	Antivenom
Brown Snake	500 Units	Brown Snake Antivenom.	12000 Units	Taipan Antivenom.
	(12000 Units	Tiger Snake Antivenom.) (See Notes)		
King Brown Snake	12000 Units	Tiger Snake Antivenom.	12000 Units	Taipan Antivenom.
	(15000 Units	Papuan Black Snake Antivenom.) (See Notes)		

Notes:

(1) Tiger Snake antivenom is not only specific for Tiger Snake Venom, it gives good cross protection against venom of the copperhead (*D. superba*) and the death adder (*A. antarcticus*). However, it gives poor protection against the common brown snake (*D. textilis*) and the taipan (*O. scutellatus*).

(2) Brown snake antivenom should be administered in a 50 ml. dose if available; otherwise, give 12000 units of either taipan or tiger snake antivenom. If symptoms persist, the situation is serious and larger quantities of antivenom should be given.

(3) Paupuan Black Snake antivenom gives good protection against the red-bellied black snakes and the King Brown Snake but no cross protection against other snakes. When available it should be used *only* after the snake has been positively identified.

In addition, several precautions are set forth by this laboratory relative to the administration of their antivenom:

a. **When there is little doubt that an effective bite from a dangerous snake has occurred and the patient is not likely to be sensitive to horse serum:**

(1) Inject intravenously a suitable dose of an antihistamine preparation. In addition, an oral antihistamine preparation (elixir) may be given.

(2) Another syringe is filled with the required dose of antivenom which has allowed to reach room temperature. It is injected very slowly intravenously with the patient lying down and kept warm. After the first few drops of serum have been injected an interval of several minutes should be allowed to elapse before injecting the rest of the material.

(3) The patient is observed for 30 minutes after the injection. Symptoms occurring later than 15 minutes after the administration of antivenom are more likely to be due to the snakebite than to the antivenom.

(4) If a tourniquet has been applied during first aid treatment, it should be released after the administration of antivenom.

b. **When there is little doubt that an effective bite has occurred and the patient is likely to be sensitive to horse serum:**

(1) Inject an antihistamine as under a. (1) above.

(2) The same syringe is then filled with a solution of 1:1000 of adrenalin of which 0.3–0.5 ml. is injected subcutaneously slowly. A corresponding smaller dose should be given to children. The syringe with the rest of its contents is covered and kept ready if required later. Some people experience unpelasant sensations after the administration of adrenalin. These symptoms usually disappear within 10–15 minutes after injection.

(3) Antivenom is injected very slowly intravenously as under a. (2) followed by procedures given under a. (3) and (4).

Should any sign of anaphylaxis occur during the injection of antivenom the administration is immediately stopped and treatment with adrenalin and antihistamine is instituted. When the patient has recovered from anaphylaxis, it is possible to continue the injection of antivenom in divided doses under a further cover of an antihistamine and adrenalin. Although this procedure is not without risk, the severity of the snakebite may dictate its adoption.

c. **When there is doubt that an effective bite has taken place:**

(1) Inject 0.1 ml. of 1:10 dilution of antivenom subcutaneously and observe the patient for half an hour.

(2) If no general symptoms occur, the rest of the antivenom may then be given intravenously and the patient observed for half an hour afterwards.

(3) If any allergic reactions occur during the trial injections of antivenom, adrenaline and antihistamine should be injected. The case s then reviewed and if it is decided that it is essential to administer antivenom, proceed as under b. above.

Finally, they specify certain general treatments of snakebite victims:

a. Patient should be placed at rest, kept from walking around and warm.

b. Plenty of fluid should be given. Alcohol should be avoided.

c. Circulatory shock should be treated by ntravenous infusion. Injection of adrenalin, soluble corticoid or vasopressin may be of value.

d. Morphine is contraindicated.

e. When pharyngeal paralysis occurs, keep patient's head low when vomiting and swab throat afterwards. Fluids should be given, if necessary, through a stomach tube or intravenously.

f. It is most important that the patient should not become a victim of his own fears.

Boquet [19] (1956) found that hyaluronidase increased the rate of diffusion of horse antivenom njected in guinea pigs subcutaneously, two-to-four-fold. Use of this substance invariably resulted in a larger number of dogs surviving ethal cobra venom doses over those treated with antivenom alone.

The South African Institute for Medical Research [20] in its annual report for 1961 states that prednisolone may help relieve symptoms of cobra bites in addition to being helpful in preventing serum reactions. It also reports that as yet there is no effective antivenom for bites by the boomslang (*Dispholidus typhus*). Dr. P. A. Christensen of this institution, in his 1955 monograph [21] on South African snake venoms and antivenoms, provided the following instructions regarding treatment of snakebite:

a. Apply tourniquet when site of bite permits.
b. Disinfect skin.
c. Make incisions through fang marks.
d. Inject contents of one ampoule of antivenene under disinfected skin at site of bite.
e. Disinfect skin and inject another ampoule under the skin or into a muscle at any suitable point of the body.
f. Apply suction.
g. Keep the patient warm.
h. Avoid unnecessary movement.

In the discussion following these instructions, Dr. Christensen makes the following points: (1) Suction should be applied whether or not incisions are made and preferably by a mechanical means. However, in the absence of such means suction by mouth may be used, the risk involved being reduced by frequent mouth wash with water or, better, with diluted antivenom; (2) In case of South African viper bites it should not be necessary to resort to the intravenous route, the serum being used to best advantage when injected at or near the site of the bite or, when this is not possible, it should be given intramuscularly or subcutaneously; (3) Because of the danger of anaphylaxis, serum probably should not be given to victims with a history of allergy, but to withhold the treatment pending results of sensitivity tests is hardly ever recommendable; (4) The dosage of antivenom varies according to the amount of venom injected and can never be precisely known; the dose should not be decreased in children but rather should be increased with decreasing body size; (5) In the case of cobra venom in the eyes, Dr. Christensen recommends that the eyes be washed out with water, saline, etc. and then with 1–5 dilution of antivenene. Unless diluted, the 0.3% cresol preservative may cause smarting.

Gilkes [22] (1959) suggested that, unless open wounds or granulating areas are present, there is no indication for the use of antitoxin (antivenom) in the treatment of cobra venom conjunctivitis when the victim is seen within 30 minutes. He reported treating a case in which *N. nigricollis* venom was sprayed into the eyes of the victim from a distance of 3 feet. Irrigation, a few drops of decicaine and application of penicillin-streptomycin ointment, constituted the treatment. The following morning the eyes were almost normal and no further treatment was administered.

Cunard [23] (1944) described snake venom as consisting of 40–70% water in addition to variable amounts of protein, mucus, albumoses, pigments and salts, corresponding to the constituents of normal saliva. He described also the symptoms of boomslang (*D. typus*) venom poisoning. This hemotoxic venom is slightly acid and causes continual oozing from the wound and mucous membranes in the mouth, nose, bladder, stomach and bowels and is responsible for the accumulation of blood in the tissues. Such internal bleeding results in large blackish swollen areas widely distributed over the body surface and may last for up to 8 months after the bite has healed. This author reports also that these black swollen areas may reappear for 2 or 3 days every 3 or 4 months for a number of years. The local symptoms which may last for 6–8 days before improvement begins, include: headache, swelling and pain at the site of the bite, vomiting, normal to subnormal temperature and collapse. The boomslang exemplifies the trait of back-fanged snakes in holding on tenaciously when it bites. The venom, when injected through clothing is subjected to absorption, resulting in more concentrated venom entering the wound. There is as yet no effective antivenom for boomslang poison. Although it is much feared and may, in some instances, cause death, it seldom constitutes a serious danger to adults.

Kathan, Huber and Leopold [24] (1956), using rabbits and rattlesnake venom, concluded that immobilization appeared to be helpful, that a tourniquet neither increased or decreased survival time, and that incision and suction decreased survival time.

Stahnke [25, 26] (1953, 1957) strongly advocated the use of a tourniquet and cryotherapy in the treatment of venomous stings as well as snakebites (probably hemotoxic venom from rattlesnakes only). Immersion in crushed ice and water for varying lengths of time was the essential part of this method.

Shannon [27] (1956) claimed there were many inherent dangers in the use of the tourniquet-ice water immersion technique and cited examples of permanent injury resulting therefrom. Shannon's recommendations were:

a. Apply tourniquet, move proximally in advance of swelling.
b. Make incisions and apply suction but never over fang marks. Incisions should not be more than ⅛ inch and made proximal to swelling. In some cases such incisions might encircle the limb and when new circles of incisions are made they should begin 4–6 inches proximally to the next preceding circle of incisions.
c. If venom is neurotoxic the patient should assume a prone rather than a supine position.
d. Cold treatment is not good—don't use it.
e. Watch for shock.
f. Use vasopressors as needed.
g. Antivenom is not always effective and might cause severe reaction.
h. Blood typing should be done. Intravenous saline, plasma and blood transfusion may be necessary.

Parrish [28] (1956), using dogs as experimental animals, concluded that wide excision and suction could be recommended under the following circumstances:

a. The guilty reptile was large.
b. The bite was on the trunk where no tourniquet could be applied and the site of the bite was suitable for excision.
c. The patient was seen within an hour after the bite.
d. No antivenom was available, as well as adjunctive medication.

He did not consider that excision and suction should replace antivenom, antibiotics, antitoxin and blood transfusion, but that it was effective if the victim was seen early and an adequate amount of tissue was excised. Excision should be performed under local anaesthesia if available.

Minton [29] (1952) and Shannon [27] (1956) expressed doubt as to the effectiveness of antivenom.

Russell[30] (1961) defined an effective treatment as one which must be instituted immediately following the bite and must include measures to remove as much venom as possible from the wound(s), to retard absorption of the venom, to neutralize the venom, to mitigate the effects produced by the venom, and to prevent complications, including secondary infections. He recommended the following specific measures for treatment of rattlesnake bite:

"Place the patient at rest in a reclining position and immobilize the injured part. If the bite is on an extremity, place a constriction band above the first joint proximal to the injury. Cruciate or longitudinal incisions of $\frac{1}{8}$–$\frac{1}{4}$ inch in length should be made through the fang marks. The incisions should be as deep as fang penetration. The depth of fang penetration may be taken as approximately $\frac{3}{4}$ of the distance between the two fang marks. Incision and suction are effective only for the first hour following the bite. Multiple incision over the involved extremity or in advance of progressive edema are not advised. After the first hour suction should be discontinued, the involved part placed in an ice bath and the constriction band removed. The ice bath should be removed after one hour and the injured part maintained at 10°–15° C. In most cases cooling measures to the injured extremity should be carried out for 24 to 96 hours.

"None of the above first aid measures should in any way be regarded as substitutes for the "3 A's": Antivenom, Antibiotic, and Antitetanus agent; nor should they be instituted at the possible expense of delaying administration of the antivenom. The amount of antivenom to be used will depend on the species and size of the snake involved, the size of the victim, the number of bites, and other factors. Bites by rattlesnakes may require 1 to 9 vials of antivenom (*Crotalidae*) Polyvalent. If the patient is not sensitive to the antivenom, the first vial should be divided into 3 portions. One portion should be given subcutaneously proximal to the bite, or in advance of the swelling. (N.B.—antivenom should **never** be injected into toes or fingers.) The second portion should be given intramuscularly into a large muscle mass. The last portion can be given into a continuous intravenous drip of physiological saline. Subsequent doses should be given intravenously in saline or intramuscularly. Repeated injection of antivenom into the injured extremity should be avoided."

Parrish[31] (1960) reported that, in reviewing the current status of incision and suction, this technique should probably continue to be used for treating bites of the North American pit vipers, and that it may not be of value in all types of venom poisoning. The British do not hold a favorable view of this technique in treating cobra bites. Parrish suggests that incision and suction should be used before the venom has become widely disseminated throughout the body (i.e., within 30 minutes of the bite) after which it is of no value.

Merriam[32] (1961) confirmed the report that, in dogs, the use of a tourniquet and incision and suction resulted in recovery of 22–44% of the injected venom if the incisions reached the level of the venom deposition, and that after 30 minutes, further suction did not result in recovery of additional venom. He recommended the following procedures:

a. Immobilization and reassurance of the victim.
b. Tourniquet and incisions $\frac{1}{4}$–$\frac{1}{2}$ in. long and $\frac{1}{8}$ in. deep, occasionally deeper.
c. Suction.
d. Transportation to a hospital as soon as possible, maintaining suction and immobilization.
e. Antivenom as needed, depending on symptoms. No indication exists where there is only minimal local reaction and there are few systemic signs.
f. Supportive measures to include sedation, tetanus booster or tetanus antitoxin if indicated, adrenal hormones for severe systemic reactions, blood transfusions as needed and a careful watch on blood pressure, urinary output (for evidence of hemolysis) and hemoglobin and hematocrit.

In an article appearing on page 323 in "Venoms" edited by Buckley and Porges[33] (1956), the author reports that a large fruit company in the Republic of Panama provides the following routine treatment for snakebite in that area:

a. Immediate transfer of patient to nearest field dispensary or hospital.
b. Application of a tourniquet which is released at intervals.
c. 15 ml. of Butantan's polyvalent Anti-bothrops antivenom is injected in a ring around the site of the bite and another 15 ml. is given intramuscularly in the buttock.
d. 1,000,000 units of penicillin is given intramuscularly.
e. 3,000 units of tetanus antitoxin is given subcutaneously.
f. Incision and suction (but not after delay of 1 hour) is performed.
g. Depending on severity, additional antivenom may be given either intravenously or intramuscularly on arrival at the hospital.

Enteric bacteria [34] have been reported to be among the predominating micro-organisms in snakes' mouths and venom sacs and thus, one of the wide spectrum antibiotics should be administered to prevent or combat infection.

Antihistamine drugs are contraindicated in pit viper poisoning, according to Schottler.[35]

Rosendale [36] (1959) recorded several considerations to be taken into account in treating cases of snakebite. The prime consideration, as stated by this author, is to determine whether the snake is poisonous, which the presence of fang punctures confirms. Other considerations are time of year (treatment in spring should be more vigorous than in mid-summer or fall because of the possibility of more concentrated venom in snakes coming out of hibernation); size of snake (roughly indicated by distance between fang punctures); age and size of patients (more vigorous treatment required for very young and very old victims); type of venom involved (hemotoxic *versus* neurotoxic); and location of the bite (determines its seriousness —intravenous injection may result in immediate death; if bite is delivered in areas with poor vascularization, toxic symptoms will be less acute).

The ligature-cryotherapy method, reported by Stahnke et al,[26] cannot yet be widely recommended, in spite of some favorable comment in the literature, until it can be demonstrated experimentally to be beneficial and not harmful to the patient.[37]

Ambrose [38] (1956) listed the following measures to be taken routinely in Central America:

a. Immediate transport of patient to hospital.
b. Application of tourniquet helpful if released at intervals.
c. Administration of antivenoms around the site of the bite and in the buttocks.
d. Administration of penicillin and tetanus antitoxin.
e. Incision and suction of no value or harm.

Halbrohr [39] (1958) provided an excellent review of treatment of snakebites from the most poisonous species in Yaracuy State, Venezuela. These species are also typical of the rest of South America, and fall into the following groups:

a. The *Proteroglypha* represented by the genus *Micrurus* of the family *Elapidae.*
b. The *Solenoglypha* represented by three genera of the family *Crotalidae: Bothrops, Crotalus* and *Lachesis.*

Micrurus venom, exemplified by venom from the tropical coral snake, *M. frontalis*, causes death from the curare-like effect of phosphidase in the venom and the neurotoxin which causes respiratory paralysis. *Bothrops* venom, exemplified by venom from *B. atrox*, the "fer-de-lance" or "manapare", causes progressive local phenomena (pain, hemorrhagic edema, blisters or phlyctenae, gangrene, etc.) and hemorrhages of the mucous membranes (spitting up of blood, nosebleeds, etc.). Direct envenomation can cause rapid death from emboli. *Crotalus* venom, exemplified by the venom from *C. durissus terrificus*, the tropical rattler or "cascabel", is extremely dangerous because of the direct effect on the nervous system. Ataxia, convulsions, paralysis, blindness, coma and hypotensions occur while local and hemorrhagic phenomena are limited. *Lachesis* venom from the bushmaster, *L. muta*, presents the most common symptoms of both bothropic and crotaline venoms. However, the effects on the nervous system are more prominent. *Bothrops* species account for the majority of snakebites in South America. *Lachesis* and *Micrurus* poisoning occur very rarely.

Treatment of victims of envenomation with antivenoms prepared for the above species, if it is to be successful, must be instituted in a minimum of time. However, prompt and proper first aid treatment carried out not far from where the bite occurs can save the lives of almost all the victims. It is important to identify the snake if possible since the selection of the proper antivenom is thus immediately allowed. When this is not possible measure the distance between the fang marks in order to obtain a sufficiently exact idea of the length of the snake according to the following table:

Distance between fang marks (mm.)	Approximate length of snake (meters)	Probable Genus	Average length of adults (meters)
5–7	0.24–0.40	*Micrurus*	0.30–0.35
10–13	0.7 –0.92	*Crotalus*	1.0 –1.40
17–20	1.46–2.00	*Bothrops*	1.0 –1.80
24 or more	3.0 or more	*Lachesis*	2.20–2.50

The amount of poison injected has a direct proportion to the size of the snake and there is a definite relation between the amount of poison and the amount of antivenom required to neutralize it. All of the South American antivenoms (manufactured at special institutes in Brazil: Pinheiros, Vital Brasil, Butantan) carry a label indicating the quantity of dry extract of venom which a unit volume of antivenom will neutralize. Halbrohr [39] recommends that as an initial dose, an amount that will neutralize three times the probable amount of poison received, should be used. Depending on the commercial product used, South American antivenoms will neutralize 4.0, 6.0 or 10.0 mgms. of poison in dry extract. 1.0 ml. of poison from *B. atrox*, "fer-de-lance" or "manapare", will produce about 20 mgm. dry extract. Thus, if it is decided that a snake of 1.50 meters probably delivered 2.0 ml. of poison into the wound (40 mgm. dry extract) and the ampoule (10 ml.) used neutralizes 10 mgms. of dry extract, then it would take 40 × 3 = 120 ml. to neutralize the poison.

Carruthers [40] (1959), in discussing the emergency treatment of snakebite in British Guiana, recommended that the bitten limb be elevated to prevent undue edema and padded to absorb the serosanguinous discharge. He suggested that polyethylene glycol-impregnated dressing was preferable to vaseline gauze which tends to cause maceration of the wound and the skin surrounding it. He also suggested early use of antitetanus and antigas-gangrene serum as well as antibiotics. Large doses of vitamins is reported to definitely speed the healing process. Carruthers also discussed the need and desirability of skin grafting.

Mendes et al.[41] (1960), after studying the allergic reaction of several cases, reported that there seems to be a common allergen to all venoms studied (*Bothrops*, *Lachesis*, *Vipera*, *Micrurus*) as well as allergens peculiar to each genus. Some patients presented positive intradermal and/or passive transfer tests with venoms with which they had not had any previous contact. The venoms apparently possess extremely potent allergens because persons with no personal or familial history of allergy, were sensitized 6 months to 5 years after contact.

The most prolific medical authority on the treatment of sea snakebite has been Dr. H. A. Reid,[42–50] of the General Hospital, Penang, Malaya. Perhaps the most informative report by Dr. Reid is entitled "Diagnosis, Prognosis and Treatment of Sea Snake Bite".[45] Dr. Reid has the following to say concerning the treatment of sea snakebite: "It has become increasingly obvious that local mechanical or first-aid measures are irrelevant to the *medical* treatment of sea snakebite, because by the time the doctor sees the victim it is too late for them to do any good. It cannot be emphasized too often that most sea snakebite victims require no medical treatment other than reassurance. In my experience, this is best achieved by an injection of placebo (regardless of the patient's intelligence, social status, or creed).

"Further treatment is needed: (1) if symptoms of envenoming are already evident; (2) if the patient is seen within one hour of being bitten, even though symptoms of poisoning are absent; (3) if the patient has an effective tourniquet in position. It is not yet known whether appreciable venom is excreted by the kidneys in man; . . . but it is rational to promote a diuresis, not only to encourage excretion of venom and secondary toxic products but also to minimize renal damage.

"Recent research with specific antivenene in systemic viper-bite poisoning has demonstrated that antivenene administration is not as urgent as had been thought. Specific antivenene is highly effective in reversing systemic viper bite poisoning even several days after the bite, so it is safe to wait until there is clear evidence of systemic poisoning before giving viper antivenene. It is hoped this will also apply to sea snake antivenene, so that the only indication for its use will be clinically significant poisoning. In that case, not more than one in four victims will require antivenene. It should be given intravenously after a sensitivity test has been found negative: the safest way is by diluting it with saline (or with the glucose, calcium, and sodium lactate infusion) and giving it in a drip as a rule. Serum reactions can then be controlled without difficulty.

"Of the physiological antidotes, rest is the most important. In idiopathic myoglobinuria, Pearson et al (1957) advocates almost complete immobilization for three to four weeks to avoid tearing the fragile sarcolemmal sheaths which normally guide the regenerating muscle-fibres. In the early stages, postural treatment is vital to prevent inhalation of vomit; and it is particularly needed in the first week when, besides difficulty in turning, coughing may be feeble. The patient should be kept off his back so that gravity will assist tracheal drainage of chest secretions and infection and lung collapse are thus avoided.

"The three main items in supportive treatment are combating (1) respiratory failure, (2) electrolyte disturbance (especially hyperkalaemia), and (3) renal failure.

"The doctrine of 'masterly inactivity' has, with certain reservations, become increasingly appropriate—in keeping with the treatment traditional over the centuries among Chinese fishing folk, who forbid talking, smoking, eating and movement for at least twenty-four hours after a sea snakebite.

"Correct diagnosis and prognosis are very important, and they can confidently be made by simple clinical methods. Sea snake antivenene will shortly be available and may benefit some patients."

Sea snake antivenom will be commercially available from the Commonwealth Serum Laboratories, Melbourne, Australia, during the summer of 1962.

4. BUREAU OF MEDICINE AND SURGERY GENERAL POLICY CONCERNING TREATMENT OF SNAKEBITE BY PHYSICIANS [51]

Every effort should be made to get the victim of a venomous snakebite under the care of a physician as soon as practicable. The details of the treatment of each individual case are best determined by the attending physician. The following outlines recommended therapeutic procedures.

a. **Antivenom.** Polyvalent, or preferably, specific antivenoms prepared from venomous snakes in the same geographic area should be administered in therapeutic quantity recommended by the manufacturer. Antivenom should be given intravenously during hospitalization provided that sensitivity tests indicate that the patient is not allergic to the antiserum to be used. Desensitization, if necessary, should precede the administration of antivenom by any route.

b. **Incision and Suction.** Substantial amounts of venom can be removed from subcutaneous deposits by incision and suction during the first half hour. After an hour following envenomation, on the other hand, attempts to remove venom by incision and suction at the site of the bite would be of no value. However, if marked subcutaneous pitting edema develops, interstitial pressure can be relieved by several longitudinal incisions extending into the subcutaneous tissues. Suction and fasciotomy may be required at times.

c. **Tourniquet.** The prolonged use of a tourniquet would increase local tissue damage to the action of the venom and might delay the vascular transport of antivenom into envenomated areas. A tourniquet applied following a bite by a venomous snake should be removed if envenomation seems mild or after a potent antivenom is given in therapeutic quantity.

d. **Immobilization.** During transportation and most of the early hospitalization period, immobilization of the affected part and absolute rest should be continued. The extremity should be immobilized in the position of function and active and passive exercises to prevent contraction started after the third day if consistent with the patient's condition. A sedative or analgesic may be administered to relieve restlessness and anxiety; ice bags to alleviate severe pain should be applied only for a short time so as to prevent cold injury.

e. **Antibiotics.** A broad-spectrum antibiotic should be administered promptly in appropriate dosage if the reaction to envenomation is severe. Since the nature of the injury markedly predisposes to infection, and pathogenic bacteria are found in the wound, this use of antibiotics seems justified. A massive wound infection with severe systemic reaction could be mistaken for severe envenomation.

f. **Blood Transfusion.** Blood transfusions may be necessary and at times have been followed by marked improvement. Studies of the several factors involved in blood clotting may be useful as guides to treatment. The first and subsequent specimens of urine should be examined for the presence of red blood cells, hemoglobin and protein. Progressive decrease in the total volume of circulating red blood cells has been attributed to the development of massive hemolytic anemia or internal hemorrhage.

g. **Tetanus Prophylaxis.** A tetanus toxoid "booster" inoculation should be administered upon admission.

h. **Corticosteroids.** The use of corticosteroids should be restricted to the prevention or treatment of late manifestations of allergy following the administration of antivenoms.

i. **Electrolyte Balance.** Abnormalities of fluid and electrolyte balance should be detected and corrected on a continuing basis.

j. **Respiratory Paralysis.** If respiratory paralysis develops following envenomation, the use of tracheostomy and intermittent positive pressure artificial respiration is indicated.

k. **Renal Shutdown.** An awareness of this complication can do much toward the prevention and treatment of secondary effects arising after its occurrence. Routine daily tests such as B.U.N., CO_2 combining power and serum potassium levels are indicated in severe cases of envenomation.

l. **Unevaluated Therapeutic Measures.** The following measures have not been adequately evaluated and are not generally recommended:

(1) Isolation—perfusion of an extremity with antivenom.
(2) Local use of cold.
(3) Exchange transfusion.
(4) Early excision at the site of the bite.

See the appendices for a list of sources of antivenoms according to geographical areas.

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CHAPTER VI

Recognition of Poisonous Snakes

1. BACKGROUND

The recognition of poisonous snakes and their differentiation from non-poisonous varieties, in some instances, is very simple because of widely known and generally constant and easily recognized characteristics. For instance, rattlesnakes, as indicated by their name, are easily recognized—when the rattle has not been lost! In other cases and in other geographical locations, recognition is not so simple because the identifying characteristics are not so widely known. However, some of the other groups or species of snakes can be just as easily recognized.

The selection of the proper treatment of snakebite in many cases depends upon the specific identification of the snake. Antivenom prepared against one member of a group may not be effective against the venom of other members of that group. This chapter, therefore, deals with the ways and means of recognizing and identifying the poisonous species.

2. A FEW USEFUL FACTS ABOUT SNAKES

a. Except for a few species in Southeast Asia and Africa, snakes are passive by nature and will avoid contact with human beings unless cornered or injured in some way. The harmless species are often more prone to attack than the deadly species. Aggressiveness during the breeding season is a characteristic of some species of both groups.

b. Snakes do not have external ears and are totally deaf; however, they are extremely sensitive to vibrations and very small differences in temperature. The ground-dwelling, nocturnal species do not see very well and cannot see at all during the shedding process.

c. All snakes are predatory and all swallow their prey whole.

d. In case of emergency, it should be remembered that snake flesh is palatable food, poisonous species included. In fact, in some parts of the world, including the U.S., snake meat is a delicacy.

e. Stepping on a snake under water is just as dangerous as it is on land. A snake may, if so inclined, bite while swimming but its effectiveness in striking is reduced. All snakes swim with ease and many of them can stay under the water for many hours without drowning.

f. Snakes are among the cleanest animals in the world and are far from being slimy as they are commonly held to be. A snake's skin is essentially dry and possesses few or no skin or dermal glands.

g. Snakes do not have tail stingers. In a few species the final scale may be pointed, thus superficially resembling a stinger, but it has no such function.

h. Snakes in the process of shedding their skin are likely to be more irritable than usual. It is believed to be a painful experience probably accounting for their increased irritability and sluggishness during the shedding process.

3. GENERAL DISTINGUISHING FEATURES

The external characteristics of snakes provide a key to species identification. The discussion included here provides the basic elements of snake identification designed for use by non-specialized or lay personnel. The keys included herein are lists of snakes together with characteristics which they share or which separate one group or species from another. Thus, by the use of such keys, one is able, in the majority of cases, to determine the identity of the specimen(s) at hand. It will be noted that, throughout Chapter VII, under each species, characteristics defined in this section are set forth for use in describing and identifying poisonous species in the field. The characteristics which separate the dangerously venomous groups from their non-poisonous relatives are emphasized. There are, however, many species possessing poison glands but which lack good mechanical means for injecting their venom into humans. Members of this group (the back-fanged snakes—*Opisthoglypha*), with one or two exceptions, are omitted as being beyond the scope of this study. Such snakes are not to be handled indiscriminately because the toxicity of their venom is unknown in most cases. It is conceivable that they might succeed in injecting dangerous amounts of venom by biting one's hands or fingers (the thin tissue between the thumb and forefinger provides an ideal location for such a bite). The notorious "Boomslang" (*Dispholidus typus*) of Africa is a member of this group and large enough to be capable of injecting a dangerous amount of venom into human beings in much the same manner as other species of poisonous snakes. The "Boomslang" is highly feared in many parts of Africa and there is a tendency to confuse it with another dangerous snake, the green mamba (*Dendroaspis viridis*). Careful inspection, however, reveals many differences (see Chapter VII).

a. **Dentition (Arrangement of Teeth).** The presence of fangs not only immediately labels the specimen as poisonous, but, depending on the type of fangs, provides a means of deciding the group to which it belongs. Fangs are specialized, usually enlarged, grooved or hollow teeth through which venom is injected when the victim is bitten. The presence, position and movability of fangs is the first and most reliable step to take in determining the poisonous or non-poisonous nature of the snake. Many snakes have relatively short fangs (cobras, kraits, corals, etc.) while others have very large fangs (rattlesnakes; burrowing vipers, genus *Atractaspis,* of Africa; etc.). Hence, in some cases, this determination requires a careful examination. **Always use a stick or other instrument in probing the snake's mouth (alive or dead) for the presence of fangs.** Final identification of fangs requires a determination of whether the fangs are hollow or grooved. Figure 1 shows diagrammatically the various types of fangs associated with the different groups.

b. **Sensory Pits.** Certain groups of snakes possess a sensory organ between the nostrils and eyes which is capable of detecting infrared or heat radiation in extremely small amounts. This organ is known as a "pit" and the snakes possessing it are known, therefore, as "pit" vipers. All pit vipers are poisonous but the reverse is not true. American coral snakes, for example, are very poisonous but do not possess a sensory pit. Thus, examination of the snake for the presence of a sensory pit is a valuable, and when present, reliable indication of the poisonous nature of the snake. These snakes belong to the family *Crotalidae.* Pit vipers of the Far East belong to the genera *Agkistrodon* and *Trimeresurus;* in the United States, to the genera *Crotalus*, *Sistrurus* and *Agkistrodon;* in Central and South America, to the genera *Lachesis*, *Bothrops* and *Crotalus;* in addition, one species of *Agkistrodon* is found as far south as Central Mexico. There is only one pit viper in Europe, none in Africa, and one in the Near and Middle East; however, they are extremely rare in these places. They are quite prevalent in North, South and Central America and the Far East. The venom from most pit vipers is essentially hemotoxic in nature (see Chapter III for a discussion of the kinds of poison in snake venom and the symptoms they cause). An exception is the venom of the South American rattlesnake, *C. durissus terrificus*, which possesses a powerful neurotoxin, as does the venom of *Lachesis muta*, the bushmaster.

c. **Rattles.** The presence of rattles immediately identifies the genus *Crotalus* which includes most of the rattlesnakes. However, the rattles are frequently lost, making this characteristic unreliable as a recognition factor. In the abence of the rattle, the **presence** of large fangs and a sensory pit and the **absence** of head

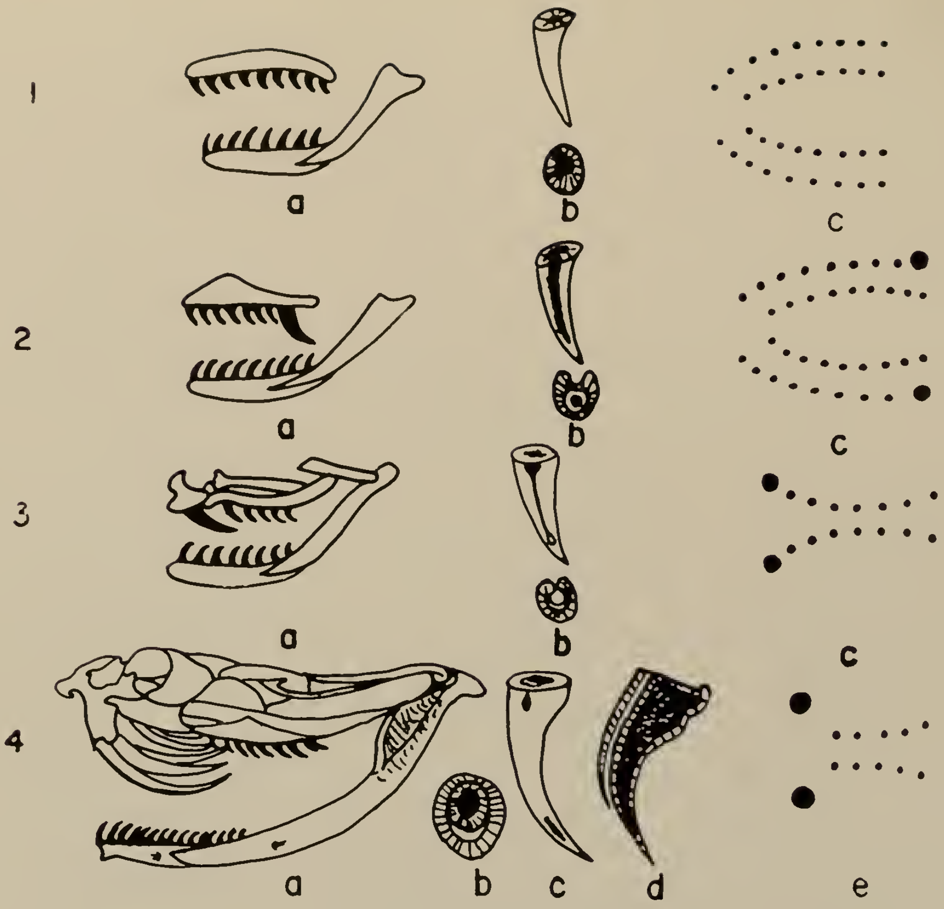


FIGURE 1.—Types of fangs.

1. Aglyphic. 2. Opisthoglyphic. 3. Proteroglyphic. 4. Solenoglyphic. a. Skeleton of head showing fangs. b. Side view and cross section of fang. c. Bite impression (except in No. 4, in which the side view, vertcal midsection, and bite impression of solenoglyphic snakes are represented by c, d, and e, respectively. No. 4a represents the skeleton of the head of *Bitis arietans*, the African puff adder.

shields (except in the pigmy rattlers) suffice to identify rattlesnakes.

d. **Skin Color Patterns.** Coloration is unreliable as an identification characteristic, except in a few instances (e.g., the U.S. coral snakes) or in the hands of experts. Color patterns in juveniles are different from those of adults and adult patterns vary somewhat depending upon the locality in which they are found. While color characteristics are generally unreliable for identification purposes, color observations are valuable adjuncts to recognition of snakes in a particular area. The pattern of coloration usually is more stable than the color itself. For example, banded snakes like *Bungarus* are not found without the bands (except one species) but the color thereof may differ from species to species. Most of the dangerously poisonous snakes do not have longitudinal stripes. The genera *Maticora, Callophis* and *Hemibungarus* of the Far Eastern *Elapidae* do have longitudinal stripes but they are small, rare and therefore not considered as great threats to human life. They are, however, poisonous.

e. **Shape of the Head.** The shape of the head is quite characteristic of many species; however, the shape of the head bears no relation to the poisonous or non-poisonous nature of the snake. All snakes with a triangular shaped head are not necessarily poisonous and many species in which the head is not differentiated from the neck are dangerously poisonous.

f. **Shields, Scales, and Plates.** These terms are applied to external structures possessed by all snakes. In some references "shields" and "plates" are used interchangeably; however, in this study, "shields" refer to the horny, armature-like structures found only on the head; whereas, "plates" refer only to the overlapping belly structures. These belly plates are sometimes referred to as "ventral scales", but generally they are known simply as "ventrals". Likewise, the words "shields" and "scales" are generally not written: 'dorsals" should be read "dorsal scale rows" and the head shields are known by their various proper names, such as "temporals", "rostral", "labials", etc. Scales, shields and plates and their interrelationships provide an excellent means of identifying species. While some variation is to be expected, the arrangement of these structures are sufficiently constant within each species to aid in recognition and identification.

(1) **Head Shields.** All of the head shields have special names and are included here to aid in field identification when other means of identification do not suffice. Beginning on the back or top (dorsal) side and proceeding from the nose towards the tail of the animal, the head shields are:

(a) **Rostral.** This is the most anterior (towards the front) shield and may be referred to as the nose shield. Generally it occurs as a single shield but sometimes it is divided vertically or horizontally—in which case, it becomes a valuable aid to identification. This shield may or may not be visible when one is observing the snakes head from directly overhead. Whatever the arrangement, it is characteristic of the species.

(b) **Internasals.** These shields lie "between the nostrils" as the name implies. In most species there are two of them, one on either side. Rarely one or both are missing or they are fused at the mid-line.

(c) **Prefrontals.** These are the next pair of shields towards the tail after the internasals. Generally there are two; however, like the internasals, they may be found fused at the mid-line.

(d) **Frontals.** The central and generally the largest shield on the head is called the frontal and occupies the space between the supraoculars (upper oculars). Most species of snakes have only one frontal. Pythons have two.

(e) **Parietals.** Two large shields occurring just behind the frontal. These shields border the frontal, the supraoculars and the temporals.

(f) **Occipitals.** The occipitals occur just behind the parietals, when present. Two large occipitals are characteristic of the king cobra (*Naja hannah*). In other species, when they occur, there may be as many as three.

A side view of the head reveals the following shields:

(g) **Labials.** As their name implies, these shields rim the mouth of the snake. Those on the upper lip are known as superior or upper labials; those on the lower lip, inferior or lower labials.

(h) **Postnasals.** These are small shields which lie, when present, immediately behind the nasal shield and between the upper labials and the prefrontals. When more than one occurs, they are referred to as "superior" and "inferior" in order to identify their position.

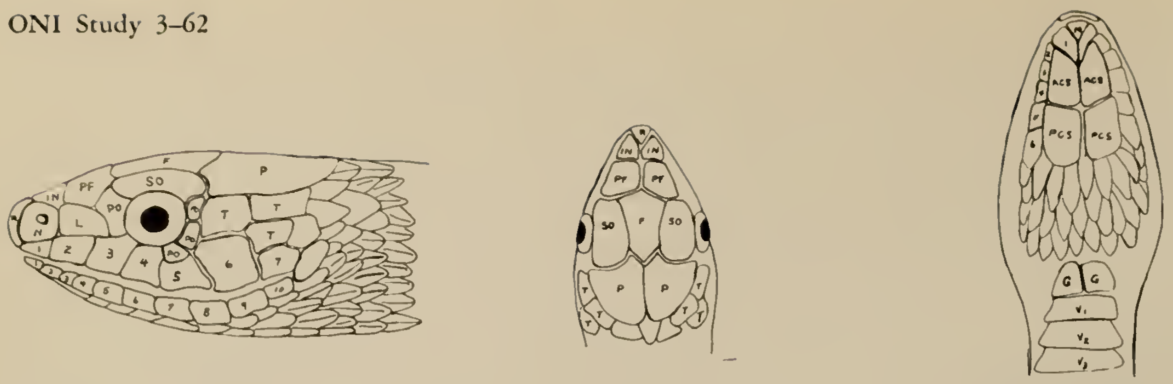
(i) **Loreal.** This shield, which is quite diagnostic of certain groups of snakes, when present, is located between the nasal shield and the eye but borders neither. In other words, it lies between the upper labials and the prefrontals and is bordered anteriorly by the postnasals and posteriorly by the preoculars. This is the same position as the sensory pit in the Family *Crotalidae*. In fact, it is referred to many times as the "loreal pit", less frequently as the "lacrimal pit" or "lacrimal fossa".

(j) **Oculars.** Ocular shields surround the eyes and are referred to according to their position relative to the eye:

Supraoculars—over the eyes
Suboculars—under the eyes
Preoculars—in front of the eyes
Postoculars—behind the eyes

In many species suboculars do not occur—in which case, one or more of the upper labials is enlarged and takes the place of the suboculars in the orbit of shields surrounding the eyes. These shields are said to be "touching the eye".

(k) **Temporals.** These shields occur just posterior to the postoculars between the upper labials and the parietals. In some instances, there may be as many as three series with two or three scales arranged more or less vertically. Each series is referred to according to the num-



Lateral view

Dorsal view

Ventral view

FIGURE 2.—*Dispholidus Typus.*

Key:
R—Rostral
IN—Internasal
L—Loreal
N—Nasal
PF—Prefrontal
PO—Preocular
SO—Supraocular
F—Frontal
P—Parietal
T—Temporal
M—Mental
ACS—Anterior Chin Shields
PCS—Posterior Chin Shields
G—Gular
V—Ventrals
1,2,3—Labials

ber of shields in that series. For example, the formula, 1+ 2 is a common arrangement and means that there is one temporal that borders the postoculars, upper labials and parietal and two temporals behind the first one, one over the other. The latter shields border the first temporal, the upper labials in many cases and the parietal.

Turning now to the ventral or underside view of the snake, the following shields are seen:

(l) **Mental.** This shield is the most anterior shield on the under surface and corresponds to the rostral on the upper side of the head. It is triangular and borders the inferior labials and usually the anterior chin shields.

(m) **Anterior Chain Shields.** These shields occur just posterior to the mental with which they are generally in contact (but not in all instances) and border the inferior labials as well as the posterior chin shields.

(n) **Posterior Chin Shields.** Following just posterior to the anterior chin shields, these shields may or may not be in contact with the labials or anterior chin shields and never in contact with each other. The **mental groove** is located between the two pairs of chin shields. Figure 2 graphically illustrates the head shields of the "Boomslang".

(o) **Gular Shields.** These shields occur in only a few species and are located between the posterior chin shields and the first ventral plates.

(2) **Scales.** Scales appear on the dorsal or back surface (except the head) of all snakes in a characteristic number of rows. Dorsal head shields are replaced by scales in some of the *Crotalidae* and *Viperidae.* In these cases the scales may be randomly distributed or may occur in rows. Scales cover the lateral portions or sides of the snake until they meet with the ventral plates. The scale rows vary depending on the part of the body being counted. For example, the scale rows on the neck of a cobra are more than those found on the mid-body (midway between the head and the vent or anus). In the descriptions in Chapter VII, when only one number is given it refers to the count of scale rows at the mid-body position. In many references, three counts are given which refer to the neck, mid-body and vent region counts, respectively. Scales may be overlapping (**imbricate**) or **juxtaposed** (lying side by side) but in all cases they are separated from each other by thin connections of skin. In some species, scales may have what are known as **apical pits** (depressions in the posterior portion of the scales) or they may be referred to as being **keeled** (a ridge down the midline of each scale). When only part of the scales are keeled the location of the keeling is specified. Some species may have **tuberculated** scales (bead-like or rounded elevations of the central portion of the scales). Finally in some species, scales may be pointed (e.g., *Atheris sp.*) or rounded at the posterior end. Figure 3 illustrates the proper way of counting dorsal scale rows.

(3) **Plates.** There are three kinds of plates: (1) **ventral** plates (on the belly anterior to the vent); (2) **anal** plates (specialized ventral plates occurring as the first, and sometimes the second, plate anterior to the vent) and (3) **subcaudal** plates (ventral plates beneath the tail (posterior to the vent)). Ventral plates may be keeled down the mid-ventral line or, in a few species, two parallel keels occur. The anal plate may be single or divided. Occasionally, the anal plate may be broken up into several small plates. The subcaudal or tail plates may also be either single or divided and in a few species both single and divided subcaudals occur on the same specimen. Figure 4 illustrates some of the arrangements of the ventral, anal and subcaudal plates.

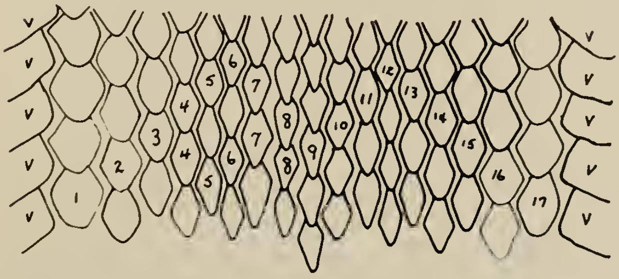


FIGURE 3.—Proper way of counting dorsal scale rows

4. GROUP IDENTIFYING CHARACTERISTICS (KEYS TO FAMILIES AND GENERA)

a. **Introduction.** The classification given herein has been derived from many sources. It is designed to be a simple yet accurate guide to the most common poisonous species which military personnel are likely to encounter. Thus, it is not a comprehensive guide to all poisonous species. Furthermore, species identification may be impossible because of local variations. However, the descriptions given in Chapter VII include the most prevalent species. Generic definition is believed to be sufficiently accurate for military purposes, i.e., to select appropriate antivenom and/or treatment for those bitten by snakes.

Snakes belong to the **Animal** Kingdom, phylum *Chordata*, sub-phylum *Vertebrata*, class *Reptilia*, order *Squamata*, sub-order *Serpentes* and the poisonous species are placed in four families. Some members of the fifth family (*Colubridae*) are technically poisonous but the great majority of them are not dangerous to man. Two species of this family are described herein. Except in a few instances, no attempt has been made to identify local varieties (subspecies). The keys include identification guides for the four families and 48 genera. Detailed descriptions of species are given in Chapter VII.

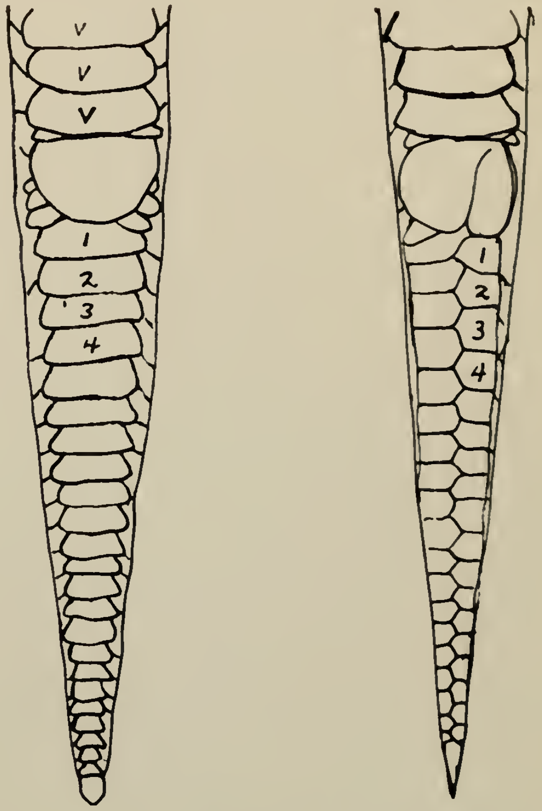


FIGURE 4.—Typical forms of anal and subcaudal plates.

(Left: Single anal and subcaudal plates. Right: Divided anal and paired subcaudal plates.)

b. **Classification by Dentition.** The division of snakes into series according to the arrangement and characteristics of their teeth has long been utilized as a practical approach to the recognition of the dangerous species. Very little, if any, variation in teeth is observed among adult individuals of the same series. However, juveniles usually have teeth reminiscent of the baby or milk teeth in man, and they may be lost in approximately the same manner. Thus, the snakes fall into four (4) series:

(1) **Aglypha** (meaning "having no fangs"). All teeth are solid and more or less uniform in size and length. Such snakes belong to the sub-family *Colubrinae* of the family *Colubridae* and none of them are venomous.

(2) **Opisthoglypha** (meaning "having posterior fangs"). Commonly known as the rear or back fanged group, these snakes usually have permanently erect fangs located immediately beneath their eyes. Thus, unless it is a large snake or has a large mouth, a snake of this group cannot bite a human, except in certain places like the web between toes and fingers. Their fangs are not hollow but are grooved slightly. Because the fangs are attached to poison glands, they can deliver a certain amount of poison, once the fangs are inserted into tissue. They are therefore technically poisonous but except for two species described herein they are not considered dangerous to man. Snakes of this series belong to the sub-family *Boignae* of the family *Colubridae.*

(3) **Proteroglypha** (meaning "having anterior fangs"). Commonly known as the front fanged group, this series includes the cobras, mambas, coral and sea snakes. Members of this series belong to two families, *Elapidae* and *Hydrophidae.* They have deeply grooved, rigid, relatively short fangs. A cross section of such fangs shows that the groove is almost completely closed, forming substantially a canal through which the poison flows.

(4) **Solenoglypha** (meaning "having canalized fangs"). Commonly known as the vipers and pit vipers, members of this series belong to two families, *Viperidae* and *Crotalidae.* They have highly developed, hollow, relatively large fangs in the front part of the upper jaw which are attached to movable bones and are erected during the striking act. When not being used (i.e., when the snake's mouth is closed), the fangs are encased in sheaths of tissue and rest folded back against the palate. Approaching an inch and a half in length in some species, the fangs of this series resemble and function in much the same manner as hypodermic needles. Most species have several reserve fangs which quickly replace broken or extracted ones. Thus, the fangs of this group are characterized by being movable, completely hollow and relatively large. The opening at the external end of the fangs, in some species, is occasionally modified in such a manner that the venom may be ejected in a fine stream or spray. This modification is probably more typical of certain proteroglyphs, the spitting cobras (*Naja* and *Hemachates*).

c. **Instructions on the Use of the Keys.** When attempting to identify snakes using the keys given herein, follow these instructions:

(1) **Identify the Family first.** The characteristics given for the families are shared by all members of that family.

(2) **Next, consult the distribution chart** in the appendices for the particular continental area and country in which located.

(3) **Identify the Genus,** after having eliminated those which do not exist in the country in which located. Some genera have only one known member and therefore description of that genus is omitted in the discussion.

(4) **Identify the species,** if possible. Only the most common dangerously poisonous species are listed for each country. A detailed description of most of the species listed in the keys will be found in Chapter VII. Except in a few instances classification through the genus is sufficient to select the proper antivenom for treatment.

d. **Key for Identifying Families of Poisonous Snakes.** In using this key, known as a dichotomous key, remember that all poisonous snakes will fall into one or the other of the two possibilities listed at each level. Continue determining which of the two possibilities listed coincides with observed characteristics of the snake being identified, until the family to which it belongs is determined. Then proceed to the generic keys of that family.

I. Observe the tail.

A. Tail round.	B. Tail flattened.
All families of poisonous snakes, except the sea snakes, share, in addition to a round tail the following characteristics: 1. *Eyes are distinct,* but in some instances, may be small. 2. *Belly is covered with enlarged plates* that are three times as broad as the scales bordering them. 3. *None have vestiges of hind limbs.* 4. *All possess one or more pairs of poison fangs.*	This characteristic, in addition to the presence of rigid, small or short fangs near the front of the upper jaw, promptly identifies a member of the sea snake family: *HYDROPHIDAE*

II. Observe the fangs.

A. Fangs not movable.	B. Fangs movable.
Grooved, not encased in tissue sheath. (1) Fangs located in front part of upper jaw: *ELAPIDAE* (2) Fangs located in back part of upper jaw, below eyes: *COLUBRIDAE*	Hollow or deeply grooved; encosed in tissue sheath when not in use. See III.

III. Look for a Facial Pit (between nostril and eye).

A. Facial (sensory) pit not present.	B. Facial pit present.
Rattles never present: *VIPERIDAE*	Some have rattles on tail: *CROTALIDAE*

e. The Fangless and Back Fanged Snakes (*Aglypha* and *Opisthoglypha*).

(1) **Family *Columbridae*.** This family is divided into two sub-families: (1) the *Boiginae* which have grooved fangs usually occupying a position immediately beneath the eyes and collectively referred to as the *Opisthoglypha;* (2) the *Colubrinae* which have solid teeth and are collectively referred to as the *Aglypha*. Except to point out that the larger members of *Aglypha,* such as the pythons, while non-venomous, may never-the-less inflict severe wounds, this group will not be considered further in this guide. However, there are two genera of the *Boiginae,* which are considered potentially dangerous and sufficiently common in the regions where they occur, to be mentioned:

(a) **Genus Dispholidus.** This genus contains only one known species, *D. typus,* the notorious "Boomslang" or tree snake of Africa. See Chapter VII for identifying characteristics. The Boomslang bears a superficial resemblance to a much more dangerous snake found in the same areas of Africa, the mamba (*Dendroaspis viridis*). Commonly known as the green mamba, it is differentiated from the Boomslang by:

(1) **Fang position** at the very front of the upper jaw promptly identifies the mamba.

(2) **Manner of inflicting bite.** The Boomslang has a tendency to chew its victim when it bites because of the disadvantageous location of its fangs; whereas, the mamba strikes with much speed and the fangs are just as quickly removed.

(3) **Scales on the mamba are very oblique and smooth;** whereas, the Boomslang's scales are not so oblique and are strongly keeled.

(4) **Ventral (belly) plates on the mamba are considerably greater in number** than on the Boomslang.

(5) **When frightened, the Boomslang resorts to distending its neck;** whereas, the mamba does not indulge in this habit.

(6) **Venom of the Boomslang causes symptoms commonly associated with hemotoxin;** whereas, the venom of the mamba and other *Elapidae* produces predominantly neurotoxic symptoms.

(b) **Genus *Thelotornis*.** This genus also has but one species, the bird or twig snake, *T. kirtlandi,* which resembles superficially some of the forms of the Boomslang. This snake also distends its throat when angry, but more in a vertical direction than laterally. See Chapter VII for detailed characteristics.

f. Snakes with Rigid Front Fangs (*Proteroglypha*). This series includes two large and important families, the *Elapidae* and the *Hydro-*

phidae. The outstanding characteristic of these families is the possession of one or more pairs of short, rigid, immovable, deeply grooved (almost tubular) fangs at the very front of the upper jaw. The *Hydrophidae* are differentiated from the *Elapidae* by the possession of a flattened oar-like tail and by their almost exclusively marine habitat.

(1) Family ***Elapidae.*** This family includes the cobras, tree cobras, as the mambas are sometimes called, the American coral snakes and all of the poisonous snakes of Australia (for which a separate key is provided). Members of this family exhibit considerable variation in color and habits, often closely resembling non-poisonous varieties, but all members share certain characteristics (see table II). Table I is a key to the genera of this family, world-wide.

TABLE I. Key to the Genera of Elapidae

A. African Genera.

1.	(a)	Tail more than 1/7th of total length	2
	(b)	Tail less than 1/9th of total length	3
2.	(a)	Head short; snout broader than long; body cylindrical	4
	(b)	Head long, narrow; snout not broader than long; body slightly compressed; scales very oblique; ventrals 202–270; subcaudals 97–121	**DENDROASPIS**
3.	(a)	Rostral shield normal size and shape	4
	(b)	Rostral shield very large, detached at the sides	**ASPIDELAPS**
4.	(a)	Scales not at all oblique	5
	(b)	Scales more or less slightly oblique; scale rows 13–15, smooth; ventrals 138–172 (avg. 141–168); subcaudals 13–29, paired	**ELAPSOIDEA**
	(c)	Scales very oblique	6
5.	(a)	No teeth in maxilla except fangs; tail short; scales in 23 rows, smooth; ventrals 189–197; subcaudals 45–51 (2nd to 9th may be entire, rest paired); desert snake	**WALTERINNESIA**
	(b)	3–4 teeth in maxilla in addition to fangs; tail long; ventrals 192–221; subcaudals 67–80, paired; scale rows 21–23, smooth; water snake	**BOULENGERINA**
6.	(a)	Scales smooth	**NAJA**
	(b)	Scales keeled	**HEMACHATES**

B. Asiatic Genera.

1.	(a)	Row of enlarged scales along mid-line of back (vertebral scales enlarged)	**BUNGARUS**
	(b)	Vertebral scales not enlarged	2
2.	(a)	Large snakes, not brilliantly colored; neck dilatable	**NAJA**
	(b)	Long slender snakes, often striped and/or banded and usually having red in color markings; neck not dilatable	3

TABLE I. Key to the Genera of Elapidae—Continued

3.	(a)	1–6 small teeth on maxilla behind fangs	**HEMIBUNGARUS**
	(b)	No teeth on maxilla behind fangs	4
4.	(a)	Poison gland in temporal region; heart, in live specimens, in anterior third of body; anal paired	**CALLOPHIS**
	(b)	Poison gland elongated, extends far posterior to temporal region; heart, in live specimens, found in middle third of body; anal single	**MATICORA**

C. Australian Genera.

1.	(a)	Viper-like (i.e., broad head, short tapering tail)	2
	(b)	Not viper-like	3
2.	(a)	Scales smooth; subcaudals single	**BRACHYASPIS**
	(b)	Scales on back, keeled; subcaudals paired	**ACANTHOPHIS**
3.	(a)	Rostral shield of ordinary size and form	4
	(b)	Rostral shield very large, detached at sides	**RHINOPLOCEPHALUS**
4.	(a)	Ventral shields of ordinary curved form	5
	(b)	Ventral shields laterally angulate and notched	**HOPLOCEPHALUS**
5.	(a)	Scales smooth	6
	(b)	Scales strongly keeled	**TROPIDECHIS**
6.	(a)	Fangs followed, after short space, by 7–15 small grooved teeth	**DEMANSIA**
	(b)	Fangs followed by 1–5 small teeth which may be indistinctly grooved	7
7.	(a)	Subcaudals paired (at least at the posterior part of the tail)	**PSEUDECHIS**
	(b)	Subcaudals single	8
8.	(a)	Scales arranged very obliquely	**NOTECHIS**
	(b)	Scales not oblique	**DENISONIA**

D. American Genera.

1. The American members of this family all belong to three genera: *Leptomicrurus*, *Micrurus* and *Micruroides*, the latter of which differs from *Micrurus* by the presence of small teeth in maxilla in addition to fangs. There are about 40 species (some of the more important of which are differentiated in Tables X and XI in Chapter VI). Most species are brilliantly colored in bands of different colors, the pattern of which is typical of some species. The maxilla is short and has no teeth except fangs. There is no neck and the head and eyes are small but distinct. There is no loreal shield; scales are smooth in 15 dorsal rows; subcaudals are paired; tail short. Secretive, burrowing snakes, they are generally not seen except occasionally after rains. Some specimens may reach 5 feet in length; average size 18–24 inches.

TABLE II. Common characteristics of family Elapidae

1. Body scales generally smooth.
2. No visible neck.
3. Head covered with large (compared to scales) armor-like shields (a characteristic shared with most non-poisonous species).
4. Pupils of the eyes are always round.
5. Loreal shield missing.

TABLE II. Common characteristics of family Elapidae—Continued

6. A mental groove is always present (under the chin).
7. Supraocular shield, if present, always single.
8. Ventral plates nearly as broad as body.
9. Fangs not encased in much of a tissue sheath (except in American corals).

(a) **Genus *Boulengerina* (the water cobras of Africa).**

The common characteristics of the members of this genus include: (1) they are large water snakes; (2) Ventrals 192–221; (3) subcaudals, 67–80; (4) Head short, snout broader than long; (5) scales not oblique; (6) tail more than $\frac{1}{7}$ of total length; (7) typical cobra hood with black annulations or bands surrounding body; (8) three species (see Table III).

(b) **Genus *Bungarus* (the Kraits of Asia).**

Table III. Species of Genus Boulengerina

Species	Dorsal scale rows	Temporal Formula
B. annulata	23–25	1+2
B. stormsi	21	1+2
B. christyi	17	2+2 or 2+3

The kraits are among the most poisonous snakes in the world and all species have the following characteristics in common: (1) Vertebral (dorsal median) scales are greatly enlarged; (2) short tail; subcaudal plates, single (rarely paired posteriorly); (3) anal scale, single; (4) usually conspicuously banded with alternate black and white or yellowish or orange bands; (5) body scales hexagonal, smooth and in 13 to 19 rows; (6) highly toxic but bite only with extreme provocation. See table IV for differentiation of species.

Table IV. Differentiation of species of Genus Bungarus

Species	Dorsal Scale Rows				Ventrals	Subcaudals	Subcaudals divided at the tip of the tail?	2nd upper labial decidedly narrower than 3rd?	Body compressed?	Number of bands or bars on the body	Number of bands or bars on the tail	Habitat
	2 head lengths behind head	mid-body	2 head lengths before anus	Vertebrals in midbody broader than long?								
flaviceps	13	13	13	yes	193–226	46–54	yes	(?)	(?)	(none)		Malay Archipelago and Peninsula; Cochin China; Tenasserim.
bungaroides	15	15	15	yes	220–237	44–51	yes	yes	no	Many white chevrons: lines.		Eastern Himalaya, Khasi Hills, Cachar.
lividus	15	15	15	no	209–215	35–42	no	yes	no	(none)		Brahmaputra Basin, South of Himilayas.
caesuleus	15	15	15	yes	200–218	38–50	no	no	no	Many white lines in prs.		Indus Basin, Ganges Basin, Peninsular India and Ceylon.
ceylonicus	15	15	15	yes	219–235	32–40	no	yes	no	15–20 Complete white bands.	2–5	Ceylon.
fasciatus	15	15	15	yes	200–234	23–39	no	yes	no	16–27 Complete yellow bands.	2–5	Brahmaputra Basin, Mahanadi Basin, Irrawaddy Basin, Indo and South China, Malay Peninsula and Archipelago.
magnimaculatus	15	15	15	yes	218–229	42–49	no	yes	no	11–14 White bars only.	2–3	Irrawaddy Basin.
multicinctus	15	15	15	yes	194–218	45–53	no	yes	no	31–48 White bars only.	11–13	Lower Brahmaputra and Irrawaddy Basins, Andamans, South China, Formosa.
niger	15	15	15	yes	216–231	47–57	no	yes	no	(none)		Brahmaputra Basin.
sindanus	17	17–19	17	yes	201–237	43–52	no	no	no	Many white lines in prs.		Rajputana, Sind, Baluchistan, Punjab.
walli	17–19	17–19	17	yes	192–207	46–55	no	yes	yes	Many white beaded lines.		Ganges Basin.
candidus	15	15	15	yes	210–222	40–50	no	(?)	no	20–25 White bars only.	7–9	Malay Peninsula and Archipelago.
wanghaotingi	15	15	15	(?)	225–228	47–53	no	(?)	(?)	22–23	10–11	Southwestern Yunnan Province, China.
javanicus	15	15	15	yes	210	46	no	yes	no	(none)		Java.

(c) Genera ***Callophis***, ***Hemibungarus***, and ***Maticora***. The members of these three genera are collectively referred to as the oriental coral snakes. In some respects, they resemble the American coral snakes, except for their longitudinal stripes. For example, they are nonaggressive, secretive, burrowing snakes with bright coloration, generally have small eyes and round pupils and do not normally exceed about 2 feet in length. However, in both groups, rare specimens as long as 5 feet have been reported. The oriental corals are the only significantly poisonous species having longitudinal stripes. They are closely related and it may be difficult to differentiate species within the three genera. The following key should suffice, after having determined that (1) the snake has rigid front fangs and (2) is longitudinally striped:

TABLE V. Key to species of Callophis, Hemibungarus and Maticora (The Oriental Coral Snake)

1.	(a)	One to several solid small teeth on maxilla behind large, grooved, rigid fangs (Genus **HEMIBUNGARUS**)	7
	(b)	No maxillary teeth except fangs	2
2.	(a)	Anal plate single; poison glands extend far into body; heart in middle third of body (Genus **MATICORA**)	3
	(b)	Anal plate divided; poison glands only in temporal region; heart in anterior third of body (Genus **CALLOPHIS**)	4
3.	(a)	Head, tail and undersurface red	*M. bivirgata*
	(b)	Undersurface barred black and white, tail black and red	*M. intestinalis*
4.	(a)	Vertebral black line on body; found in Nepal and Darjeeling	*C. macclellandii univirgatus*
	(b)	No vertebral black line on body	5
5.	(a)	Ventrals plus subcaudals 229–247; cross bands on body 22–27; found on mainland Asia	*C. m. macclellandii*
	(b)	Ventrals plus subcaudals 246–247; cross bands on body 27–37; found in Formosa	*C. m. formosensis*
	(c)	Found in Malaya or Ceylon	6
6.	(a)	Ventrals 303–324; belly barred black and white; 6 upper labials; subcaudals 21–28; tail ending in blunt point; about two feet; found in Malaya	*C. gracilis*
	(b)	Ventrals 176–203; belly red; 7 upper labials; subcaudals 21–31; about 18 inches; found in Malaya	*C. maculiceps*
	(c)	Ventrals 225–265; vent in bright scarlet patch; subcaudals blue; ventrally yellow, throat bluish near neck, shading into orange posteriorly 6 upper labials; dorsally light cinnamon brown, each scale with a spot of darker brown. The spots form 12 longitudinal series along body. Found in Ceylon	*C. melanurus sinhaleyus*
7.	(a)	Smooth dorsal scale rows, 13; subcaudals more than 25 (Formosa and Loo-Choo Islands)	8
	(b)	Smooth dorsal scale rows, 15; subcaudals less than 23 (Philippines)	11
8.	(a)	4–6 small solid teeth behind a pair of large grooved fangs; ventrals less than 230	9
	(b)	2 small solid teeth behind fangs; ventrals more than 230	10

TABLE V. Key to species of Callophis, Hemibungarus and Maticora (The Oriental Coral Snake)—Continued

9.	(a)	Pale coral red above with one or 3 narrow black longitudinal stripes and 12–18 distinct transverse black rings; ventrals 190–206	*H. japonicus*
	(b)	Coral red above with 5 black longitudinal stripes, and 10–22 transverse rings edged in white; ventrals 183–221	*H. boettgeri*
10.	(a)	Dark crimson above with 3 broad black longitudinal stripes; ventrals 249–269	*H. sauteri sauteri*
	(b)	Dark crimson above with 3 broad black stripes, the lateral ones being interrupted by black cross bands edged by narrow white markings; ventrals 238–248	*H. sauteri hatorii*
11.	(a)	Temporals, 2 or 2+2+2; anal plate single; 6 upper labials	12
	(b)	No temporals; anal plate divided; 7 upper labials; yellowish occipital collar	*H. collaris*
12.	(a)	Second upper labial not touching preocular; anal plate very wide but single; may have two preoculars; ventrals 197–257; subcaudals 19–23, paired; temporals, 2+2+2	*H. calligaster*
	(b)	Second upper labial touches preoculars; anal plate single; temporals, 2; subcaudals 21; paired; ventrals, 206	*H. mcclungi*

TABLE VI. Key to species of Genus *Dendroaspis* (The Mambas)

1.	(a)	A large upper temporal in contact with the whole outer border of the parietal	2
	(b)	Temporal formula 2+3 or 4, two in contact with the outer border of the parietal; scales in 19 to 25 rows; outer row not shorter than dorsals	4
2.	(a)	Scales in 13 rows, outer row half as long as dorsals	*D. viridis*
	(b)	Scales in 15–19 rows; outer row not shorter than dorsals	3
3.	(a)	Subcaudals 94–104; tail uniformly black; found in East Africa	*D. jamesoni kaimosae*
	(b)	Subcaudals 103–122; tail green, each dorsal and subcaudal scale margined with black; found in West Africa	*D. jamesoni jamesoni*
4.	(a)	Second upper labial much deeper than first	5
	(b)	Second upper labial not deeper than first; scales in 21–23 rows; ventrals 248; subcaudals 117	*D. polylepis antinorii*
5.	(a)	Scale rows 19 (17–23); 8 upper labials; 2 upper temporals in contact with outer border of parietals, posterior one separated from its fellow on the other side by 3 or more scales; anterior upper temporal not longer than lower one; ventrals 209–232; subcaudals 109–126; inside of mouth white or bluish white; length up to 9 feet	*D. angusticeps*

TABLE VI. Key to species of Genus *Dendroaspis* (The Mambas)—Continued

(b) Scale rows 25; 9 upper labials; upper anterior temporal twice as long as the lower one; ventrals 269; subcaudals 116 .... *D. mamba* *

(c) Scales in 21–25 (usually 23) rows; ventrals 242–282; subcaudals 105–127; inside of mouth bluish-grey to black; length up to 14 feet (average adult 12 feet) .... *D. polylepis polylepis*

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* Probably a form of *D. polylepsis.*

(d) **Genus *Dendroaspis* (the mambas or tree cobras of Africa).**

The mambas are among the more aggressive poisonous snakes in the world, particularly during the mating season, and have the distressing habit of entering human habitations. Venom is quite deadly without treatment but antivenom is life saving. These snakes are incredibly fast. Pittman (1938) in his book on the snakes of Uganda stated that "A mamba's trail through dusty country is marked by a trail of rising dust and its speed renders it practically invisible. It is rivaled for speed only by the Boomslang which is no match for a mamba!" Mambas have the following characteristics in common: (1) Fangs literally right under their noses; (2) fangs are not followed by other teeth in the upper jaw, but the genus is characterized by much enlarged teeth at the front of the lower jaw; (3) body scales are very oblique, narrow, occur in 13–25 rows and are smooth without pits; (4) tail is long (more than 1/7th of total length); (5) snout not broader than long; (6) body slightly compressed laterally and slender; (7) ventrals 202–270 and rounded; (8) subcaudals 97–121; paired; (9) head long and narrow; pupils round; (10) anal plate divided; (11) very potent venom. See table VI for differentiating characteristics of the species belonging to this genus.

(e) **Key to the Species of Australian *Elapidae.*** All of the common poisonous land snakes of Australia belong to this family. The key (table VIII) that is given herein should be used only after consulting the geographic distribution chart of the Australian species given in table VIII. This chart will eliminate from consideration certain species and references to the eliminated species in the key may then be overlooked.

TABLE VII. Geographic distribution of Australian *Elapidae*

Area	Tiger Snake	Death Adder	Copperhead	Taipan	Common Brown	King Brown	Red-bellied Black Snake
W. Australia		X			X	X	
S. Australia	X	X	X(SE)*		X	X	X(SE)*
SW. Australia	X				X	X	
E. Australia					X	X	X
N. Territory		X		X	X	X	
Queensland	X(S)*	X		X	X	X	X
New South Wales	X	X	X(Mtns)*		X	X	X(E)*
Tasmania	X		X		X		
Victoria	X		X		X	X	X
Bass Straight Islands	X				X	X	

*SE-southeast; S-south, Mtns-mountains; E-east.

TABLE VIII. Species of Key to the Australian *Elapidae*

Species	Dorsal scale rows	Subcaudals	Anal plate	General Features
Notechis scutatus. . . . . (Tiger Snake).	17–19 (15–17 in Tasmania).	Single.	Entire. . . .	Average length 3 ft. 6 in., broad headed. Light grey to dark green or orange. Dark transverse bands. Black and dark brown (unstriped) forms in Tasmania, Bass Straight Islands and Victoria (rare).
Acanthophis antarcticus. . . . . . (Death Adder).	21–23 (anterior scales keeled).	Single (last few divided.)	Entire. . . .	Length 9 inches to 2 feet, 6 inches; short, stout body, banded, tapering adder like tail, broad head.
Denisonia superba . . . . (Copperhead).	15.	Single.	Entire. . . .	Length 3 feet to 5 feet, 6 inches; sluggish, thick-set; yellow-brown, black; lateral scales orange or red; white lips.
Oxyuranus scutellatus. . . . . (Taipan).	21–23 (indistinctly keeled).	Paired.	Entire. . . .	Length up to 9 feet; average length, 6 feet; Large brown snake, distinguished from other brown snakes by scale arrangement.
Brown Snakes:				
Demansia textilis. . . . . (Common Brown Snake).	17.	Paired.	Divided. .	Length up to 6 feet; average 4 feet; slim, rapid-moving, high-striking snakes; dark brown to putty color; cream spotted belly; young are banded. Some adults are also banded (in Queensland).
Demansia nuchalis. . . . . (Gwarda).	17.	Paired.	Divided. .	
Demansia affinis. . . . . (Dugite).	19.	Paired.	Divided. .	
Pseudechis australis. . . . . (King Brown Snake).	17.	Paired.	Divided. .	Length up to 8 feet; coppery brown to tan; belly *not* spotted (this characteristic distinguishes this snake from other brown snakes).
Pseudechis porphyriacus. . . . . . (Red-bellied black Snake).	17.	Paired.	Divided. .	Length up to 7 feet; glossy black with purplish sheen; lateral and ventral scales and plates red.

(f) **Genus *Elapsoidea* (African Garter Snakes).** This is a tropical and South African genus containing a few species of small, short-tailed, viper-like snakes which average less than two feet in length. The genus is characterized thus:

(1) Fangs on maxilla followed posteriorly by 2–4 small solid teeth.
(2) Head short and not distinct from neck; snout rounded; rostral visible from above; eyes small with round pupil.
(3) Body slim, cylindrical and glossy; tail very short and stubby.
(4) Dorsal scales oblique, smooth without apical pits and in 13–15 rows; ventrals rounded, anal entire and subcaudals all or most are paired.

Only one species (*E. guentherii*) is widespread and common; however, the following key differentiates several species, complete documentation of which is not available. *E. nigra* is said to be a color variant of *E. guentherii* (Pittman, 1938). Table IX is the key to the genus.

TABLE IX. Key to species of *Elapsoidea*

1. (a) Dorsal scales oblique, smooth and in 13 rows; subcaudals 13–25 2
   (b) Dorsal scales in 15 rows; subcaudals 31–36.. 3
2. (a) Internasals much shorter than prefrontals; frontals a little shorter than parietals; diameter of eyes less than their distance from nostrils (adult); banded

TABLE IX. Key to species of *Elapsoidea*—Continued

		coral-pink and white but color varies to grey and black; first lower labials in contact behind mental	*E. guentherii*
	(b)	Frontals much shorter than parietals; banded in black and white; maximum length 2½–3 ft.; diameter of eye equal to distance from nostril	*E. sundevallii*
	(c)	Mental in contact with anterior chin shields (first lower labials not in contact)	*E. hessi*
3.	(a)	Lower labials in contact behind mental shield; internasals hardly ½ as long as prefrontals	*E. boulengeri*
	(b)	No suboculars; ventrals average 150	*E. duttoni*
	(c)	Two suboculars, ventrals average 172	*E. multifasciatus*

(g) **Genus Micrurus (American Coral Snakes).** Members of this genus and the closely related genera *Leptomicrurus* (meaning "slender *Micrurus*") and *Micruroides* (meaning "Micrurus-like" and set aside as a separate genus because of the presence of a small solid tooth on the maxilla in addition to the fangs) are the only American representatives of the family *Elapidae*. They are exclusively American. There are about 40 species, closely related, many of which are geographically restricted and in general are rarely seen anywhere since they are burrowing, secretive snakes. They average about 2–4 feet in length, although one species, *M. spixi*, the giant Amazonian coral, is known to reach a length of 5 feet. All of them are extremely poisonous and it is very important to be able to recognize them in order to apply the proper treatment when and if bitten. Table X is a good guide to use in Central and South America. In North America, true corals may be reliably differentiated by remembering two facts:

1. Everybody knows that a red traffic light means "stop", and a yellow light means "caution". When these two colors touch each other in banded snakes, it is a poisonous coral, with very rare exceptions.
2. The snout of poisonous corals is always black.

The following short key separates the three important sub-species of *M. fulvius:*

1.	(a)	No black on dorsal scales of the red rings; found in extreme southern Florida	*Micrurus fulvius barbouri*
	(b)	Black markings on the dorsal scales of the red rings	2
2.	(a)	Many irregular black streaks and spots in the red rings	*Micrurus fulvius tenere*
	(b)	Black markings in red rings tend to form two large spots	*Micrurus fulvius fulvius*

N.B.—*M. f. tenere* ranges from Arkansas and Mississippi to South Texas and into northeastern Mexico; whereas, *M. f. fulvius* ranges from Florida north to North Carolina and west to the Mississippi river.

TABLE X. Differentiation of Poisonous and Nonpoisonous Coral Snakes in Central and South America

Poisonous Species	Nonpoisonous Species
1. No neck present.	1. A definite neck present.
2. Very small eyes.	2. Large eyes.
3. Short thick tail (resembles head in shape).	3. Relatively long tail.
4. Body surface opaque.	4. Body surface bright.
5. Black bands bordered by bands of yellow or white on both sides.	5. Yellow or white bands bordered by black bands on both sides.
6. Loreal shield not present. The postnasal and preocular shields are in contact with each other.	6. Loreal shield present between the postnasal and preocular shields.

There seems to be three groups of coral snakes depending upon their coloration:

Group I. Red band on head and 2–5 tail. (Represented by *M. mipartitus.*)

Group II. Three black bands separated by two yellow or white bands, the triads being separated by broad red bands. (Represented by *M. lemniscatus* and *M. dissoleucus.*)

Group III. Very large or wide red bands separated by narrow yellow-edged black bands. (Represented by *M. carinicauda* and *M. circinalis.*)

The key to coral snakes does not, by any means, include all forms of coral snakes. Indeed, only a fraction of the known species are discussed. For the purposes of this study, it is considered that, together with the key, the following definition of the genus and the previously given differentiation of poisonous and non-poisonous corals, provide all the needed information to be able to recognize and identify coral snakes: Head small and neck not distinguishable; maxilla short carrying a pair of short stationary grooved fangs at extreme anterior end (proteroglyphic); eye small with elliptical or semielliptical pupil; head scalation, 1 rostral, 2 nasals (divided); 2 prefrontals, 1 frontal, 2 parietals, loreal absent, 1 preocular; 15 scale rows, all single; ventrals vary widely in number; "supra-anal" plates are characteristic of males in some species; subcaudals paired or partially single.

TABLE XI. Key to the Genera *Micrurus* and *Micruroides* (The Coral Snakes)

1.	(a)	6 upper labials, 2nd and 3rd touching eye; snout narrow; ventrals 209	*M. heterochilus*
	(b)	7 upper labials	2
2.	(a)	4th upper labial touching eye, frontal very narrow; ventrals 167–182	*M. surinamensis*
	(b)	3rd and 4th upper labials touching eye	3
3.	(a)	7th upper labial very small; rostral large; ventrals 215–241; subcaudals 21–29	*Micruroides euryxanthus*
	(b)	7th upper labial well developed; rostral moderate	4
4.	(a)	1st lower labials in contact	5
	(b)	1st lower labials not in contact; mental touching anterior chin shields	22
5.	(a)	1st lower labials in contact; posterior nasal not in contact with preocular; ventrals 191; subcaudals 23	*M. gravenhorstii*
	(b)	Posterior nasal in contact with preocular	6
6.	(a)	Parietals longer (even if but slightly) than their distance from the internasals	15
	(b)	Parietals not longer than their distance from the internasals	7
7.	(a)	Eye nearly as long as or a little longer than its distance from the mouth; ventrals 189–227	8
	(b)	Eye shorter than its distance from the mouth; ventrals 179–231; subcaudals 30–53	14
8.	(a)	Frontal 1 and ⅓–⅔ as long as broad	9
	(b)	Frontal not or but slightly longer than broad; subcaudals 29–45	12
9.	(a)	Frontal longer than its distance from the end of the snout; anterior chin shields as long as or a little shorter than the posterior chin shields	10

TABLE XI. Key to the Genera *Micrurus* and *Micruroides* (The Coral Snakes)—Continued

	(b)	Frontal as long as its distance from the end of the snout; anterior chin shields shorter than the posterior chin shields	13
10.	(a)	Temporals 1+1	11
	(b)	Temporals 1+2; subcaudals 39–43	*M. buckleyi*
11.	(a)	Subcaudals 37–54	*M. langsdorffii*
	(b)	Subcaudals 29	*M. anomalus*
12.	(a)	Temporals 1+1; third upper labial not or but scarcely larger than 4th	*M. annellatus*
	(b)	No anterior temporal; 6th upper labial large, bordering parietal; 3rd upper labial larger than 4th	*M. decoratus*
13.	(a)	Subcaudals 16–23; rostral a little broader than deep	*M. heterozonus*
	(b)	Subcaudals 29–47; rostral much broader than deep	*M. elegans*
14.	(a)	Frontal as long as the parietals	*M. dumerilii*
	(b)	Frontal shorter than the parietals	*M. corallinus*
15.	(a)	Anal plate entire; ventrals 168–181; subcaudals 22–29	*M. hemiprichii*
	(b)	Anal plate divided (very rarely entire)	16
16.	(a)	Snout obtusely pointed, projecting considerably beyond the mouth; ventrals 200–221; subcaudals 19–28	17
	(b)	Snout broadly rounded, scarcely projecting beyond the mouth	18
17.	(a)	Parietals a little longer than their distance from the internasals	*M. tschudii*
	(b)	Parietals very elongate	*M. dissoleucus*
18.	(a)	Anterior temporal large and deep	20
	(b)	Anterior temporal very narrow, sometimes absent; ventrals 210 or more	19
19.	(a)	Ventrals 210–278	*M. mipartitus*
	(b)	Ventrals 303	*M. fraseri*
20.	(a)	Ventrals 180–240 (see list next page).	
	(b)	Ventrals 241 or more	21
21.	(a)	Ventrals 241–262; subcaudals 30–39	*M. lemniscatus*
	(b)	Ventrals 290–308; subcaudals 35–45	*M. filiformis*
20.	(a)	Ventrals 180–240:	
		(1) Subcaudals 30–59; frontal usually more than 1½ as long as broad; anterior chin shields shorter than posterior	*M. fulvius*
		(2) Subcaudals 32–47; frontal not more than ½ as long as broad; anterior chin shields shorter than the posterior	*M. psyches*
		(3) Subcaudals 22–29; eye measuring two-thirds its distance from the mouth in the adult (largest of the coral snakes); anterior chin shields shorter than the posterior	*M. spixii*
		(4) Subcaudals 15–26; eye measuring ⅔ to ¾ its distance from the mouth in the adult	*M. frontalis*

TABLE XI. Key to the Genera *Micrurus* and *Micruroides* (The Coral Snakes)—Continued

	(5)	Subcaudals 23–42; eye measuring ⅖ its distance from the mouth in the adult; anterior chin shields not or but slightly shorter than the posterior	*M. marcgravii*
22.	(a)	Temporals 1+1	23
	(b)	No anterior temporal; ventrals 240–315	*M. narduccii*
23.	(a)	Ventrals 255–268; frontal much broader than the supraocular	*M. mentalis*
	(b)	Ventrals 258; frontal little broader than the supraocular	*M. ancoralis*

(Key adapted from Boulenger, 1896.)

(h) **Genera *Hemachates*, *Naja*, and *Walterinnesia*** (the Cobras). The cobras are among the most dangerous and most feared serpents on earth and deserve their deadly reputation. Some forms are not aggressive but this cannot be said to be a generic characteristic! One example of a non-aggressive cobra is *H. haemachatus*, the South African spitting cobra or ringhals (Dutch for "ring-necked"). This snake spits its venom when approached as a defensive mechanism; however, when its bluff is called, it will hurriedly endeavor to escape or sham death by curling the front half of its body over, lies perfectly still and literally plays possum. The young of this species do not sham death. Because of this and other distinctive differences, the ringhals is placed in another genus. The same is true of the other cobras with generic names other than *Naja* (e.g., *Walterinnesia*, *Boulengerina*). The cobras are confined to the old world and primarily to Africa. Some forms have spread to Asia; the Asiatic *N. hannah*, the king cobra, being the longest (not heaviest) poisonous serpent known.

The characteristics of the genus *Naja* are as follows:

(1) Immovable grooved fangs in front part of maxilla (upper jaw) followed by 1–3 small, faintly grooved posterior maxillary teeth.
(2) Mandible (lower jaw) has numerous and fairly large recurved teeth (not fangs), the anterior one being the longest.
(3) Head barely, if at all, distinct from neck.
(4) Eyes moderate to large with round pupil.
(5) Smooth dorsal scales, arranged obliquely in 15–25 rows (usually more numerous on neck or hood).
(6) Body cylindrical, ventrals rounded.
(7) All, or nearly all, of the subcaudals paired.
(8) Extremely intelligent, speedy, agile, and apt to be inquisitive and insolent in most cases.
(9) Average size, 6 feet, although rare specimens have been reported twice that long (exclusive of the king cobra whose maximum length is 18 feet).

Table XII is a key to the species of all cobras except the water cobras, the differentiation of which is described elsewhere in this study.

TABLE XII. Key to the Genera *Naja*, *Hemachates*, and *Walterinnesia*

1.	(a)	Long cervical ribs allow snake to flatten anterior portion of body thus forming a hood	2
	(b)	No long cervical ribs; snake forms no hood	*Walterinnesia aegyptia* *
2.	(a)	Anterior dorsal scales smooth	3
	(b)	Anterior dorsal scales keeled	*Hemachates haemachatus*

*This snake is probably identical with a form known as *Naja morgani* found in Iraq and Persia. In Chapter VII a complete description of both forms will be found.

TABLE XII. Key to the Genera *Naja*, *Hemachates*, and *Walterinnesia*—Continued

3.	(a)	Two large occipital shields behind parietals; narrow hood; up to 18 feet long (an Asian species)	*Naja hannah*
	(b)	No large occipital shields	4
4.	(a)	Dorsal scale rows 15–17 on both neck and body	*Naja anchietae*
	(b)	Dorsal scale rows on neck, 19–35; on body, 17–25	5
5.	(a)	6th and 7th upper labials not in contact with postocular; 3rd upper labial deepest	*Naja nigricollis*
	(b)	6th or 7th upper labials largest and deepest and in contact with postocular	6
	(c)	Scale rows 17–21; small cuneate (triangular) shield sometimes wedged between upper ends of 4th and 5th lower labials (diagnostic when present); 3rd upper labial touches both nasal shield and eye; spectacle-like marking on hood (except in Malayan species)	*Naja naja*
6.	(a)	Eyes separated from labials by 2–3 small suboculars; dorsal scale rows 21–23 on neck; rostral as broad or slightly broader than deep	*Naja haje*
	(b)	3rd or 3rd and 4th upper labials touch eye; rostral as broad as deep; distinctive yellowish color; confined to Cape Peninsula, South Africa	*Naja flava* (*nivea*)
	(c)	3rd and 4th upper labials touch eye; no suboculars; rostral considerably broader than deep	7
7.	(a)	Scale rows 23–29 on neck; 17–21 mid-body; eyes moderate; 6th or 7th upper labial largest and in contact with postocular; tail represents 0.17% of total length	*Naja melanoleuca*
	(b)	Scale rows 15 on body and neck; extremely large eyes (diameter about ⅔ distance from snout); extra long tail representing 0.23% of total length	*Naja goldii*

(2) **Family *Hydrophidae*.** All members of this family are properly known as sea snakes but at least one species is known to be partially amphibious. The family has two distinct sub-families depending on the nature of their ventral plates. It appears that the sea snakes are marine descendents of some krait or cobra-like land ancestor and that some members have become adapted to the marine environment more recently than others. Thus the separation into two sub-families. All of them are extremely poisonous, the venom of some species being much more poisonous than cobra venom. The members of this family are easily recognized immediately by the flattened, oar-like tail and by the fact that they are found only in coastal waters (or, in a few cases, on coastal lands immediately adjacent to the oceans). In the Philippine Islands, a species of sea snake is found in the brackish water leading from fresh water lakes into the ocean.

The sea snake family is characterized as follows:

(1) Tail strongly compressed, oar-like.

(2) Body compressed laterally, the ventrals very small in the fully marine types or more like land snakes in the semi-aquatic forms.

(3) Nostrils are usually valvular, opening either dorsally or laterally.

(4) The rostral shield has two notches at the oral border.

(5) Anterior maxillary teeth (fangs) are deeply grooved (folded into what amounts to a tube); frequently the

posterior maxillary teeth are also grooved.

(6) Deadly poisonous.

There seems to be divided opinion as to whether the sea snakes are aggressive in the presence of man. Some reports say that sea snakes are particularly viscious while others say they are docile. It is prudent to leave them strictly alone.

Sea snakes are strictly coastal inhabitants, particularly near the outfall or estuaries of rivers and streams. They are not equipped for deep dives although they may stay submerged for a period of a few hours. They breathe with lungs and must come to the surface for this purpose. Only one species, *Pelamis platurus*, is truly pelagic (sea-going) and it is therefore not surprising that this is the only sea snake to be found outside of their ancestral environment (Western Pacific and Indian Oceans). The yellow-bellied sea snake has migrated across the Pacific to the western coast of Central and South America and across the Indian Ocean to the east coast of Africa, but it is not found in the Atlantic ocean. *Enhydrina shistosa* has migrated to the coast of northeast Africa and thereabouts but has not traversed the Pacific. It is not found in South African waters. It is probable that the cold currents around the southern tips of Africa and South America represent an impenetrable barrier to these snakes. They are strictly tropical animals but there is no reason why they could not survive in the tropical coastal regions of the Atlantic Ocean.

It must be noted that members of the genera *Astrotia* and *Hydrophis*, in amazingly large numbers, have been reported several hundred miles from the coast. One report describes a solid mass of *Astrotia* twisted together and disposed in a line about ten feet wide, whose course was followed by the ship for some sixty miles and must have numbered in the millions! Such events may be related to the breeding habits of these snakes.

Sea snakes feed on fish. One authority, Dr. A. Annandale, has reported seeing sea snakes with fish spines actually protruding from their bellies, without suffering any inflammation or other apparent reaction to them. No one else has reported observations of such an extraordinary event and confirmation is therefore of great interest. A photograph or movie of such a snake would be of immense value.

The important species are differentiated under the discussion given for each genus having more than one species, and table XIII gives a key to the separation of 13 genera.

TABLE XIII. Key to the Genera of Hydrophidae (The Sea Snakes)

1.	(a)	Ventrals well developed, large transversely widened and ⅓ to ½ the width of the body; nostrils lateral or on top of snout; clearly defined anal and subcaudal plates	(Sub-Family **LATICAUDINAE**) 2
	(b)	Ventrals small or indistinguishable from body scales and never more than ¼ of body width; nostrils on top of snout; anal and subcaudal plates not clearly defined	(Sub-Family **HYDROPHINAE**) 3
2.	(a)	Nostrils lateral; nasals separated by internasal shields; bluish-grey with black bands; head marked with yellow; mandibular (lower jaw) teeth grooved	**LATICAUDA**
	(b)	Nostrils on top of snout; nasals in contact; brown with yellow, black-edged scales forming transverse markings; anterior mandibular teeth feebly grooved	**AEPYURUS**
3.	(a)	Ventrals (except at anterior end) either divided by a median fissure or vestigial or absent	4
	(b)	Ventrals distinct throughout length of body (although sometimes hardly larger than adjacent scales) and normally are single plates	8

TABLE XIII. Key to the Genera of Hydrophidae (The Sea Snakes)—Continued

4.	(a)	Head small, body long and slender anteriorly	5
	(b)	Head and fore part of body not differentiated from rest of body	6
5.	(a)	Head very small, body long and very slender anteriorly; 5–6 maxillary teeth; ventrals developed throughout; scales juxtaposed	MICROCEPHALOPHIS
	(b)	Head usually smaller than body; body long, slender anteriorly; ventrals more or less distinct, always small; all maxillary teeth grooved (sometimes faintly); 4–10 small teeth follow large fangs	DISTEIRA
6.	(a)	Head long and narrow; distance from snout to anterior border of parietals more than twice width between the eyes; temporals 3+3; parietals a little longer than frontal with 2 small equal shields inserted between them and entirely surround them; ventrals very small, divided; scales juxtaposed	PELAMIS
	(b)	Head short and broad; distance from snout to anterior border of parietals less than twice width between eyes	7
7.	(a)	Scales overlapping (imbricate), each scale margin dentate, pointed and strongly keeled; large stout snake; few anterior ventrals entire, rest divided longitudinally, the two halves overlapping; largest (not longest) of sea snakes; maximum length 5–6 feet	ASTROTIA
	(b)	Scales juxtaposed, smooth or each with a central tubercle; small snake not more than 3 feet in length; 3–6 maxillary teeth, faintly grooved, follow large fangs; ventrals vestigial or absent posteriorly	LAPEMIS
8.	(a)	Head shields, especially on snout, irregular and not wholly symmetrical	9
	(b)	Head shields regular and symmetrical	10
9.	(a)	Scales large, 31–35 rows	THALASSOPHIS
	(b)	Scales small, in irregular rows numbering 70–90 at mid-body	KOLPOPHIS
10.	(a)	Not more than 23 rows of scales around body; scales imbricate	KERILIA
	(b)	More than 25 scale rows around body	11
11.	(a)	Mental shield long, hidden in groove under the chin; scales sub-imbricate, each scale margin regular	ENHYDRINA
	(b)	Mental shield triangular, not hidden	12
12.	(a)	Ventrals broad anteriorly, narrow posteriorly; scales juxtaposed	PRAESCUTATA
	(b)	Ventrals uniform in width, undivided; scales imbricate, subimbricate or juxtaposed	HYDROPHIS

(a) **Sub-Family *Laticaudinae*.** Members of this group are not as completely adapted to their marine environment as the members of the sub-family *Hydrophinae.* In fact, one of the species is amphibious, coming ashore to lay its eggs (all other known sea snakes are viviparous, i.e., they bear living young). Clearly defined anal and subcaudal shields are found in *Laticaudinae* but not in the *Hydrophinae.* There are two genera included in this sub-family; *Laticauda* and *Aepyurus.* An unpublished report from the Pasteur Institute in Saigon, dated in 1949, indicates that the two genera may be distinguished thus:

Laticauda—Lateral fins, nasals separated by two internasals.

Aeypurus—Superior fins, nasals in contact with each other.

Note that these snakes are reported to have fins. This is the only reference available in which the presence of fins is reported. The possession of fins is difficult to explain. See table XIII for other means of differentiating the two genera.

(1) **Genus *Laticauda*.** Members of this genus possess the following characteristics in common:

1. Snout extends forward beyond lower lip.
2. Possess two large, rigid fangs in the extreme forward part of upper jaw.
3. Possess large head shields.
4. Nostrils lateral; nasals separated by internasals; preocular present, no loreal.
5. Scales smooth and overlapping (imbricate); ventrals and subcaudals well developed and large.
6. Body very elongated.

There are three species, differentiated according to the key given in table XIV.

TABLE XIV. Key to the Species of *Laticauda*

1.	(a)	Rostral divided horizontally; belly has a median keel on posterior half	*L. semifasciatus*
	(b)	Rostral not divided horizontally; belly without median keel	2
2.	(a)	Scales in 19 rows; two prefrontals	*L. laticaudata*
	(b)	Scales in 21–25 rows; three prefrontals	*L. colubrina*

(2) **Genus *Aepyurus*.** The members of this genus have the following characteristics in common:

1. Upper snout extends a little beyond the lower lip.
2. Snout short, nostrils superior.
3. Head shields large or broken up into scales; nasals in contact with each other.
4. Scales overlapping (imbricate); ventrals large, keeled in the middle.
5. Body moderate, poison fangs moderate in length and followed after a short interspace by 8–10 grooved teeth; lower (mandibular) teeth feebly grooved.

There are four species currently included in this genus, only one of which is described in this study. See Chapter VII.

(b) **Sub-Family *Hydrophinae*.** Of the eleven genera, members of which are described herein, nine of them are represented by a single species; for this reason separate descriptions are given for only the two genera represented by more than one species. Generic characteristics of single-species genera are reflected in the species descriptions given in Chapter VII. The sub-family characteristics of *Hydrophinae* are reflected in the key to the family. In that key it can be seen that this sub-family is divided into two groups depending upon the character of the ventral plates, although, in comparison with the *Laticaudinae,* they are always much reduced, modified or, in some cases, absent. The first group includes *Microcephalus, Disteira, Astrotia* and *Lapemis.* The second group includes *Thalassophis, Kolpophis, Kerilia, Enhydrina, Praescutata* and *Hydrophis.*

(1) **Genus *Disteira*.** Taylor (E. H. Taylor in "Snakes of the Philippine Islands", 1923) defined this genus as follows:

1. Snout does not extend beyond the lower lip.
2. Poison fangs large, followed by several grooved teeth; anterior mandibular (lower jaw) teeth sometimes grooved.
3. Head usually smaller than body.
4. Nostrils superior, valved, pierced in a single shield and in contact with its fellow.
5. Head shields large; preocular present; loreal usually absent.
6. Body long and slender anteriorly, frequently compressed.
7. Ventrals more or less distinct, always small.

Members of this genus are confused with members of the genus *Hydrophis*. In fact, many species, with similar specific names, may well be identical with those described as being members of *Hydrophis*. Since the definition of the genus and species are confused no key is provided for *Disteira;* however, species descriptions from Taylor are given in Chapter VII. See key for genus *Hydrophis* when difficulty arises in attempting identification of species resembling the definition given in the foregoing paragraph.

(2) **Genus *Hydrophis*.** This is a group of snakes which is undergoing rapid evolutionary expansion as evidenced by the large number of species, the development of geographic races and the variability of many of the scale characters usually useful in specific identification. It is not surprising, then, that a key to such a group may prove difficult to use and its members confused with those of other closely related genera. All species of *Hydrophis* are elongate, slender snakes whose normal length is about 6 feet. One species, *H. spiralis,* reaches a length of nearly nine feet. All have distinct ventrals but they are not much larger than the adjacent scales. Extreme care should be exercised in describing species believed to belong to this genus as some of them are known to be extremely deadly. The key (Table XV) has been adapted from Tweedie (Tweedie, M. W. F. "Snakes of Malaya", 1961) and was originally devised by Dr. M. A. Smith of the Raffles Museum, Singapore, in 1931. While the species referred to are those prevalent in Malayan waters, it will be useful in other areas because of the wide distribution of members of this genus.

TABLE XV. Key to the species of *Hydrophis*

1.	(a)	Scales on the thickest part of the body with rounded or bluntly pointed tips, distinctly or feebly overlapping	2
	(b)	Scales on the thickest part of the body sub-quadrangular or hexagonal in shape, feebly imbricate or juxtaposed	5
2.	(a)	5, rarely 6, upper labials; one anterior temporal; head small, body long and slender anteriorly	*H. klossi*
	(b)	6–8 upper labials; one or two anterior temporals; head and body not long and slender anteriorly	3
3.	(a)	Two anterior temporals; scales on neck, 29–35; on body, 37–47; body with black bands, broader above than below, or dorsal bars only	*H. cyanocinctus*
	(b)	One anterior temporal	4
4.	(a)	Scales 25–31 on neck, 33–38 on body; black bands on body much narrower than their interspaces; six to nine feet in leingth (adults)	*H. spiralis*
	(b)	Scales on neck 25–29, on body 37–41; body with black bands much broader than their interspaces; up to about five feet in length	*H. melanosoma*

TABLE XV. Key to the species of *Hydrophis*—Continued

5.	(a)	8–18 maxillary (upper jaw) teeth behind fangs	6
	(b)	5 or 6 maxillary teeth behind fangs	9
6.	(a)	14–18 maxillary teeth; 2 anterior temporals	*H. caerulescens*
	(b)	8–13 such maxillary teeth; one or two anterior temporals	7
7.	(a)	Two anterior temporals; head in the adult olivaceous	*H. ornatus*
	(b)	One anterior temporal	8
8.	(a)	Ventrals 242–306; head in the adult pale grey with a suffusion of yellow above; found on west coast of Malaya	*H. torquatus torquatus*
	(b)	Ventrals 276–325; head in the adult dark olive to blackish with yellow markings on the snout and sides; found on east coast of Malaya	*H. torquatus aagardi*
9.	(a)	Head black or grey with yellow markings; scales 25–31 on neck, 37–45 on body; ventrals 328–414	*H. brookei*
	(b)	Head black	10
10.	(a)	Scales 28–33 on neck, 49–58 on body; ventrals 414–514; found on west coast of Malaya	*H. fasciatus fasciatus*
	(b)	Scales 25–30 on neck, 39–49 on body; ventrals 323–452; found on east coast of Malaya	*H. fasciatus atriceps*

(Key adapted from Tweedie, M. W. F. "Snakes of Malaya," 1961.)

g. **Snakes with Movable Front Fangs (Solenoglypha).** The solenoglyphic snakes include two families, the *Viperidae* and the *Crotalidae,* and represent the most advanced stage of fang specialization. The fangs are greatly enlarged, situated at the very front of the mouth and hinged on movable facial or premaxillary bones in such a manner that, when necessary for striking, the fangs can be rotated into freedom from their sheathing membrane through an angle of 90°. They are hollow and the venom is discharged at the point (like a hypodermic needle) so that even if the fangs are only slightly embedded the victim gets the full benefit of the poison.

Members of both families have the same unique and curious manner of striking. They appear, on close observation, to make a backward somersault but actually they throw the whole head right back or sideways (so fast the eyes cannot follow) to enable the lower jaw to open to its full extent (i.e., into the same plane as the upper jaw) and allow the fangs to assume the striking position. In one African genus, *Atractaspis,* the fangs are of such enormous comparative length that they nearly defeat their free use and purpose.

The *Viperidae,* commonly referred to as the true vipers, are confined to the Old World; whereas, the *Crotalidae,* with their advance sensory organ which sets them apart from the true vipers, are found primarily in the New World and tropical Asia. One species, *A. halys,* barely reaches into the extreme southeastern portion of Europe. The *Crotalidae* are commonly known as the pit vipers and represent a more advanced evolutionary stage than the true vipers, but there can be no doubt that the two groups have had a common origin.

(1) Family *Crotalidae* (The Pit Vipers). The pit vipers have undergone an independent and extensive development in North America as compared with those species in Asia and South America. There are 6 genera of pit vipers: (1) *Crotalus,* centered in North America but found also in Central and South America (the most advanced structural type, possessing in addition to the sensory pit, a remarkable structure, the rattle) ; (2) *Bothrops,* of Central and South

TABLE XVI. Key to the Genera of *Crotalidae* (The Pit Vipers)

All species have solenoglyphic fangs and loreal pits (sensory organs) located between the nostrils and eyes.

A. North American Genera.

1	(a)	Tail equipped normally with a rattle	2
	(b)	Tapering tail without rattle	**AGKISTRODON**
2.	(a)	Large head shields, present	**SISTRURUS**
	(b)	Head shields broken up into unsymmetrically arranged small scales	**CROTALUS**

B. Central and South American Genera.

1.	(a)	Tail equipped normally with a rattle	**CROTALUS**
	(b)	Tapering tail without rattle	2
2.	(a)	Head covered with large symmetrical shields	**AGKISTRODON**
	(b)	Head covered with unsymmetrically arranged scales	3
3.	(a)	Subcaudals paired (terminal 10–12 further divided into 4 rows of small raised hook-like scales); tip of tail ends in sharp cutical spine	**LACHESIS**
	(b)	Subcaudals paired or single but never more than two rows	**BOTHROPS**

C. Asiatic Genera.

1.	(a)	Head covered with large symmetrical shields	**AGKISTRODON**
	(b)	Head covered with scales or small shields	**TRIMERESURUS**

America, the fer-de-lance group and called by some authors the New World representative of the Old World (3) *Trimeresurus;* the copperhead and moccasin genera (4) *Agkistrodon,* which has 9 species in Asia and 3 in North and Central America, and (5) *Sistrurus,* with about four North and Central American species; a gigantic South American form (6) *Lachesis,* whose name is taken from that one of the mythological Fates who was believed to determine the length of life in human beings. It might be added that the names of the other fates, Clotho and Atropos, the spinner of the thread of life and the inflexible one who cut it, have been favorite names for venomous snakes (given to certain African vipers) among the early herpetologists, all of whom were familiar with classical mythology.

Table XVI separates the genera on a geographic basis as well as characteristic structures.

(a) The Rattlesnake Genera, *Crotalus* and *Sistrurus*. The two genera of rattlesnakes represent two evolutionary groups but all of them have the typical solenoglyphic fangs, rattles and sensory pits. The genus, *Sistrurus* (the pigmy rattlers), represent a more primitive stage in development than *Crotalus,* since its members have large colubrid type head shields, a characteristic shared with the moccasin genus, *Agkistrodon.* On the other hand, the head shields of *Crotalus* are broken up into scales. Other characteristics which help to confirm identification of the rattlesnakes (in addition to rattles, sensory pit and large fangs) are (1) a triangular head distinct from the neck; (2) vertically elliptical pupil; (3) scales usually strongly keeled and (4) anal plate normally single. The key for *Sistrurus* (Table XVIII) is complete (except for a one rare form) but the key to *Crotalus* (Table XVII), while covering the majority of the U.S. forms does not cover all of the Central and South American species; however, it covers the most common species which may be encountered by military personnel.

TABLE XVII. Key to the species of *Crotalus* (Rattlesnakes)

A. U.S. Species.

1.	(a)	Outer edges of supraoculars extended into raised and flexible hornlike processes distinctly pointed at the tip	2
	(b)	Outer edges of supraoculars not extended	3
2.	(a)	Proximal lobe of rattle-matrix brown in adults; scale rows usually 21; ventrals in males 141; in females 144 or less	*C. cerastes cerastes*
	(b)	Proximal lobe of rattle-matrix black in adults; scale rows usually 23; ventrals in males more than 141 and in females more than 144	*C. cerastes laterorepens*
3.	(a)	Tip of snout and canthus rostralis raised into a sharp ridge, by bending up of the outer edges of internasals and canthals; rostral and mental marked vertically by a narrow light line on a red-brown ground color	*C. willardi*
	(b)	Tip of snout and canthus rostralis not raised; no central light line on rostral and mental	4
4.	(a)	Upper preocular split vertically, the anterior section being higher than the posterior and curved over the canthus rostralis in front of the supraocular; prenasal curved under the postnasal; usually a dorsal pattern of widely separated crossbars	5
	(b)	Upper preocular not split vertically or, if split, the anterior section not conspicuously higher than the posterior and not curved over the canthus rostralis; prenasal not curved under the postnasal; the pattern not so widely separated crossbars	6
5.	(a)	A dark stripe passing backward from the eye to the angle of the mouth; dorsal pattern of crossbars often not strongly differentiated from the ground color; ventral surface mottled	*C. lepidus lepidus*
	(b)	No dark postocular stripe; dorsal pattern of crossbars sharply contrasting with the ground color; ventral surface punctuated	*C. lepidus klauberi*
6.	(a)	Prenasals in contact with rostral; upper preocular not divided, or if divided, the loreal conspicuously longer than high	7
	(b)	Prenasals usually separated from the rostral by small scales or granules; upper preocular often divided, horizontally, vertically, or both	*C. mitchellii pyrrhus*
7.	(a)	Tail of alternating black, and light ash-grey rings, both colors being in sharp contrast with the posterior body color, which may be grey, dark grey, cream, pink, red, red-brown or olive-brown	8

TABLE XVII. Key to the species of *Crotalus* (Rattlesnakes)—Continued

	(b)	Tail not of alternating black, and light ash-grey rings in strong color-contrast to the body color immediately anterior to the tail	10
8.	(a)	Dark and light tail rings of approximately equal width; postocular light stripe, if present, intersects the upper labials from 1 to 3 scales anterior to the angle of the mouth; minimum scales between supraoculars 3 or more; no definite line of demarcation between the scales in the frontal and prefrontal areas; proximal rattle black	9
	(b)	Dark tail rings narrower than the light ones; postocular light stripe, if present, passes backward above the angle of the mouth; minimum scales between the supraoculars rarely more than two; a definite division line or suture between the scales in the frontal and prefrontal areas; lower half of proximal rattle light in color	*C. scutulatus scutulatus*
9.	(a)	First lower labials usually not divided transversely; general color cream, buff, grey or grey-brown (sometimes pink or red in central Arizona or New Mexico); dark punctuation conspicuous in marking	*C. atrox*
	(b)	First lower labials usually divided transversely; general color pink, red brick-red or red-brown; dark punctuations weakly in evidence or absent from markings	*C. ruber ruber*
10.	(a)	Two internasals	18
	(b)	More than 2 internasals, in contact with rostral, regardless of size or position	11
11.	(a)	Light postocular stripe 1–1½ scales wide and clearly outlined; body blotches commonly subrectangular, with even edges and usually with a narrow light border	12
	(b)	Light postocular stripe 2 or more scales wide and often indefinite or absent; body blotches, if in evidence, commonly diamonds, or ellipses, or if rectangles, with rough or serrated edges, often without narrow light borders	13
12.	(a)	Color usually green or olive-green, less often olive-brown or brown; scale rows 27 or 25; dorsal scale rows at the center of the tail, 13 or more; adult size exceeding 650 mm.	*C. viridis viridis*
	(b)	Color pink, red or red-brown; scale rows 25 or 23; dorsal scales at the center of tail 12 or less; adult size rarely exceeding 650 mm.	*C. viridis nuntius*

TABLE XVII. Key to the species of *Crotalus* (Rattlesnakes)—Continued

13.	(a)	Color straw, cream, or yellow; blotches often only faintly in evidence or obsolete in adults; adult size smaller, usually under 650 mm.	*C. viridis decolor*
	(b)	Color darker, not straw, cream or yellow; adult size larger, over 650 mm.	14
14.	(a)	Adult color vermilion or salmon; body blotches tending toward obsolescence in adults	*C. viridis abyssus*
	(b)	Adult color other than vermilion or salmon; body blotches in evidence or body black	15
15.	(a)	Ground color lighter, usually buff, or drab; body blothes occupy less or but little more longitudinal space than interspaces; secondary series of lateral blotches little in evidence; a pattern of dark-brown dorsal blotches (often with light centers) on a buff or a drab ground color	*C. viridis lutosus*
	(b)	Ground color darker, usually dark-grey, olive brown or black; dark-brown or black dorsal blotches (usually diamonds or hexagons) occupying considerable more longitudinal space than the interspaces; a secondary series of lateral blotches conspicuously in evidence. Some mountain specimens nearly uniform black, only patches of yellow scales representing interspaces on the mid dorsal line	16
16.	(a)	Usually 2 loreals; usually one or more scales at the rostral between the anterior nasal and the 1st upper labial	*C. viridis cerberus*
	(b)	Loreal usually single; usually no scales between the anterior nasal and 1st upper labial at the rostral	17
17.	(a)	Last dark tail ring about twice as wide as the others and is ill-defined	*C. viridis helleri*
	(b)	Dark tail rings are of uniform width and are clearly defined	*C. viridis oreganus*
18.	(a)	A vertical light line on the posterior edge of the prenasals and 1st upper labials	*C. adamanteus*
	(b)	No vertical light line	19
19.	(a)	Supraoculars pitted, sutured, or with outer edges broken	*C. mitchellii stephansi*
	(b)	Supraoculars not pitted	20
20.	(a)	Head larger; head length contained less than 25 times in adult body length; proximal rattle width contained in head length more than 2½ times	21
	(b)	Head notably small for a rattlesnake; head length in adults contained in body length over 25 times; proximal rattle width contained in head length less than 2½ times	*C. tigris*

TABLE XVII. Key to the species of *Crotalus* (Rattlesnakes)—Continued

21.	(a)	Usually a definite division between the scales in the frontal and prefrontal areas; scales in the anterior part of the frontal area larger than those behind; anterior body pattern not in chevron-shaped bands or not all black	23
	(b)	No definite division or continuous suture between the scales in the frontal and prefrontal areas; scales in the anterior part of the frontal area not conspicuously larger than those behind; normal pattern a series of chevron-shaped crossbands, sometimes broken or with the body all black	22
22.	(a)	Dorsal scale rows usually 23; postocular dark stripe indistinct; no middorsal reddish-brown stripe evident anteriorly; sometimes entirely black	*C. horridus horridus*
	(b)	Dorsal scale rows usually 25; postocular stripe distinct and in contrast with the ground color; a mid-dorsal reddish-brown stripe evident anteriorly	*C. horridus atricaudatus*
23.	(a)	Dorsal pattern consists of two parallel rows of small brown blotches	*C. triseriatus pricei*
	(b)	Dorsal pattern consists of a single row of large blotches	24
24.	(a)	Usually a single loreal; tail rings sharply contrasting in color	*C. scutulatus scutulatus*
	(b)	Usually two or more loreals; tail often black, or with rings faintly in evidence against a dark background	*C. molossus molossus*

B. **Common Central and South American Species.** All of the species described in this section have the following characteristics in common: (1) Outer edges of supraoculars not extended into raised, pointed or flexible horn-like processes; (2) Tip of snout and canthus rostralis raised into sharp ridges, no median vertical line on rostral and mental and markings on tail, if present, in transverse rings; (3) 2nd upper labial in contact with the anterior chin shields, number of subcaudals less than 40 in males, less than 35 in females, rattles moderate to large, tail not extremely attenuated; (4) upper preoculars not divided vertically, or if divided, more than 25 dorsal blotches or indistinct bands on body; (5) Lower anterior border of orbit separated from supralabials by 2 or more scales; (6) paired internasals and prefrontals (or canthals) recognizable; usually 4–6 plates (rarely exceeding 8 if sub-division has occurred); 2 or more loreals; tail entirely black or dark grey with dark rings faintly visible.

1.	(a)	Pair of dark vertebral stripes one to three scales wide on neck and extending 1–1½ to 5 head lengths posteriorly	*C. durissus durissus*
	(b)	No vertebral stripes or, if present, ill-defined not extending as much as 1–1½ head lengths before meeting first dorsal blotches	2

TABLE XVII. Key to the species of *Crotalus* (Rattlesnakes)—Continued

2.	(a)	Tail usually entirely black in adults; muzzle and supraoculars uniformly dark; no sharply defined markings on snout	3
	(b)	Tail grey, with dark crossbands usually evident; muzzle and supraoculars not uniformly dark; sometimes a distinct pattern on snout	4
3.	(a)	Scale rows 27; body pattern of large dark brown or black rhombs, expanding down sides as crossbands; blotches bordered by a row of light unicolored scales often enclosing patches of light scales; ground color yellowish olive, light olive green, or yellowish grey	*C. molossus molossus*
	(b)	Scale rows 25; body pattern irregular diamond shaped rhombs not extending down sides except posteriorly; ground color light brownish-olive or yellowish olive, becoming black posteriorly	*C. molossus nigrescens*
4.	(a)	Spinal ridge prominent; scales tuberculate, especially posteriorly	*C. basilicus*
	(b)	Spinal ridge absent or inconspicuous; scale tubercles not pronounced	*C. durissus totonacus*

N. B.—One important and widespread species, *C. durissus terrificus*, the South American tropical rattlesnake, does not appear in the above key; however, its full description appears in Chapter VII.

TABLE XVIII. Key to the species of *Sistrurus* (The Pigmy Rattlers)

1.	(a)	Upper preocular usually in contact with postnasal; usually 3 upper labials in contact with the pit-border scales; 11 or more dorsal scale rows at center of tail; no red or orange in the interblotch spaces on the mid-dorsal line	2
	(b)	Upper preocular not in contact with postnasal; usually 2 upper labials in contact with pit-border scales; 10 or less dorsal scale rows at center of tail; usually with red or orange between the blotches on the mid-dorsal line	3
2.	(a)	Ventral surface dark, heavily clouded with black blotches, often almost solid black; scale rows usually 25; body blotches usually less than 37; a pattern of square red-brown or black blotches on a grey-brown ground; sometimes unicolor black	*S. catenatus catenatus*
	(b)	Ventral surface mottled or spotted, the dark areas being less extensive than the light; scale rows often 23; body blotches usually more than 36; a pattern of dark red-brown blotches on a grey brown ground	*S. catenatus tergeminus*
3.	(a)	Dorsal coloration brown or light-grey; ventral surface cream, moderately flecked with brown or grey; head markings distinct; lateral spots in three series	4

TABLE XVIII. Key to the species of *Sistrurus* (The Pigmy Rattlers)—Continued

	(b)	Dorsal coloration dark-grey to black; ventral surface white, heavily blotched with dark-brown or black; head markings obscure; lateral spots in three series	*S. miliarius barbouri*
4.	(a)	Dorsal scale rows usually 21; dorsal spots wider than long and with irregular edges; lateral spots usually higher than wide; ventral spots confined to individual plates	*S. miliarius streckeri*
	(b)	Dorsal scale rows usually 23; dorsal spots oval or subcircular, edges even; lateral spots usually round; ventral spots usually occupying two adjacent plates	*S. miliarius miliarius*

(b) Genus *Agkistrodon* (Copperheads and Moccasins). This genus is one of the few with representatives in more than one hemisphere. It is likely that its origin was in Asia where several species are known. There are a few widely distributed species in the U.S. and Central America and one species may be found on the borders of the Caspian Sea.

The genus is characterized as follows:

1. Upper surface of head has nine normal shields, or internasals and prefrontals broken up into scales.
2. Body cylindrical.
3. Scales smooth or keeled, with apical pits.
4. Tail moderate or short.
5. Subcaudals single or paired.

The key to this genus (table XIX) was adapted in part from Perkins, C. B. "A Key to the Snakes of the U.S." 1949 (Bulletin #24, Zoological Society of San Diego) and partly from Maki, M. "A Monograph on the Snakes of Japan" 1931. The classification of many Asiatic species is not at all clear; therefore, their general characteristics only are to be found in the key.

(c) Genus *Bothrops* (Fer-de-lance, Hog-nosed and Palm Vipers). This genus of rattleless pit vipers is found in Central and South America and bear strong resemblences to the Asiatic *Trimeresurus*. The differences seem to be mainly those of geography. *Bothrops* is a large genus consisting of more than 40 species, but the fer-de-lance (*B. atrox*) is probably the best known and one of the most widely distributed of its members.

All members of this genus have:

1. Loreal pits.
2. Long recurved solenoglyphic fangs.
3. A triangular head distinct from the neck and covered with small scales.
4. Subcaudals in one or two rows.

TABLE XIX. Key to the species of *Agkistrodon* (Copperhead and Water Moccasins)

A. **North and Central American Species.**

1.	(a)	Scale rows 23; suboculars present; no labials touch the eye	2
	(b)	Scale rows 25; no suboculars; at least one labial touches the eye	6
2.	(a)	Dorsal markings in the form of dark, transverse "dumbells" or "hourglasses", considerably narrower on the middorsum than on the sides and rounded off at the ends, not continuous with the dark markings of the belly	3
	(b)	Dorsal markings consisting of broad, dark crossbands, not much narrower on the middorsum than on the sides of the body and continuous with the dark markings of the belly	4

TABLE XIX. Key to the species of *Agkistrodon* (Copperhead and Water Moccasins)—Continued

3.	(a)	Dorsal markings strongly constricted at middorsum (only 2–3 scale lengths in width) often divided and irregular; general color pale, sometimes pinkish; ventral markings usually not in strong contrast with ground color	*A. contortrix contortrix* (Southern Copperhead)
	(b)	Dorsal markings not so strongly constricted at the middorsum (3–5 scale lengths in width), seldom divided; general coloration usually reddish-brown or chestnut, often finely stippled with grey or brown; ventral marking usually in marked contrast with ground color	*A. contortrix mokeson* (Northern Copperhead)
4.	(a)	Belly very dark, almost uniform black or heavily mottled; subcaudals 57 or more in males, 52 or more (52–56) in females	5
	(b)	Belly not conspicuously dark, markings usually fairly well defined; subcaudals 56 or less in males, 52 or less (37–52) in females	*A. contortrix laticinctus* (Broad-banded Copperhead)
5.	(a)	Prominent light line extending posteriorly from rostral over eye to temporal region; ventrals 129–144; subcaudals 59–68	*A. bilineatus* (Mexican Moccasin)
	(b)	No prominent light line extending posteriorly; ventrals 150–153; subcaudals 52–59	*A. contortrix pictigaster* (Trans-Pecos Copperhead)
6.	(a)	General coloration olive, brown or black above, belly light; crossbands with dark borders more or less distinct, and centers of crossbands invaded by ground color; rostral and sides of snout light, usually with a distinct vertical dark line at each side of rostral; juveniles light, with sharply defined markings	*A. piscivorus piscivorus* (Eastern Cottonmouth Moccasin)
	(b)	General coloration usually dark-brown or black above and below; crossbands broad with dusky centers, little, if any, invaded by ground color; rostral and sides of snout dark with no distinct vertical dark lines; juveniles dark with little contrast between markings and ground color	*A. piscivorus leucostoma* (Western Cottonmouth Moccasin)

B. Asiatic Species.

1.	(a)	Dorsal scales smooth	*A. rhodostoma* (Malayan Pit Viper)
	(b)	Dorsal scales keeled	2
2.	(a)	Snout ending in a pointed appendage	3
	(b)	Snout not ending in a turned up appendage; subcaudals paired	4

TABLE XIX. Key to the species of *Agkistrodon* (Copperhead and Water Moccasins)—Continued

3.	(a)	Anterior subcaudals not paired; 2nd upper labial usually forming the anterior border of the loreal pit; scales in 21 rows; ventrals 162–168; subcaudals 50–60	*A. acutus* (Hundred Pace Snake)
	(b)	Subcaudals paired; scales in 17 rows; ventrals 116–138; subcaudals 27–40	*A. nepa*
4.	(a)	Scale rows 21–25	5
	(b)	Scale rows 17; distinguished from *A. nepa* by supraoculars that are wider than the frontal and as long as the parietals	*A. hypnale*
5.	(a)	Posterior labials distinct from temporals	6
	(b)	Posterior labials fused with the temporals; snout slightly turned up; scale rows 21 (rarely 23)	*A. himalayanus*
6.	(a)	Ventrals range between 132–156; dark bars or blotches are less than 30 on body	7
	(b)	Ventrals range between 155–181; body above with numerous dark bars which number more than 35	*A. halys intermedius*
7.	(a)	Dark blotches less than 24	*A. halys blomhoffi*
	(b)	Dark blotches more than 25	*A. halys brevicaudus*

N. B.—Chinese species of this genus may be recognized by the following obvious characteristics: (1) head broad and distinct from neck; (2) top of head covered with a few large regular plates; (3) viper-like in both appearance and behavior and with large, erectile fangs present in front part of mouth; (4) a deep pit between the eye and nostril.

TABLE XX. Key to a few species of *Bothrops* (Panamanian Species)

1.	(a)	Subcaudals paired; upper labials 7	2
	(b)	Majority (or all) subcaudals single; upper labials 9 or more	3
2.	(a)	Large terrestrial forms, reaching a length of 8 feet; angular body patterns often in form of an "X";; tail not prehensile except in very young; tail comparatively short and thick; subcaudals 50 to 75	*B. atrox asper* (Fer-de-lance)
	(b)	Smaller arboreal forms probably not over 20 inches in length; body patterns not angular, in form of small dark blotches; tail prehensile, long and thin; subcaudals 82 to 88	*B. monticelli* (Monticelli's Pit Viper)
3.	(a)	Supraoculars bordered laterally by two or three long-pointed "eyelash" scales; arboreal forms	*B. schlegeli* (Horned-Palm Viper)
	(b)	Supraoculars not bordered by long-pointed scales	4
4.	(a)	Rostral scale sharply upturned, projecting higher than head level; small terrestrial forms	5
	(b)	Rostral scale not noticeably upturned; arboreal and terrestrial forms	6

TABLE XX. Key to a few species of *Bothrops* (Panamanian Species)—Continued

5. (a) Rostral scale slightly upturned, usually 1¼ to 1½ times higher than wide; ventrals 147 to 159; 16 to 25 more or less regular, small quadrangular body markings .... *B. lansbergi*
(Lansberg's Hog-Nosed Viper)

(b) Rostral scale markedly upturned with proboscis-like appearance, as much as 2 times higher than wide; ventrals 130 to 145; 13 to 20 more or less distinct body blotches .... *B. nasutus*
(Horned Hog-Nose Viper)

6. (a) Body color green; tail prehensile; arboreal forms 7

(b) Body color gray or light brown; tail not prehensile; terrestrial forms 8

7. (a) Body color parrot-green, sometimes with vague black blotches; narrow light yellow line running length of first scalerow .... *B. lateralis*
(Yellow-lined Palm Viper)

(b) Body color darker green, most scales deeply spotted with black; no yellow lateral line .... *B. nigroviridis*
(Black-Spotted Palm Viper)

8. (a) Body short (less than 3 feet), extremely thick; ridge on back with 3 rows of heavily-keeled or tuberculated scales; dorsals 30 on neck, 25 mid-body and 19 in the vent area; ventrals 121 to 135 .... *B. nummifer*
(Jumping Viper)

(b) Body short but not as thick-set; mid-dorsal scale rows less heavily keeled; dorsals 23–21–19; ventrals 142 to 148 .... *B. godmani*

TABLE XXI. Key to additional species of *Bothrops*

1. (a) Prehensile tail (Arboreal species) 14

(b) Non-prehensile tail 2

2. (a) Subcaudals all or greater part in 2 rows; supraoculars large 3

(b) Subcaudals all or greater part in a single row 10

3. (a) Scales on head strongly keeled; dorsal scales strongly keeled 4

(b) Upper head shields all smooth; dorsal scales not strongly keeled; scales in 27 rows; ventrals 196; subcaudals 54 .... *B. xanthogrammus*

4. (a) Second upper labial forming the anterior border of loreal pit 5

(b) Loreal pit separated from the labials 7

5. (a) Keels on the dorsal scales extending nearly the entire length of scales; dorsal scale rows 23–33; ventrals 180–240; subcaudals 46–70 .... *B. lanceolatus*

(b) Keels on dorsal scales much shorter than the scales 6

6. (a) Scales in 25–29 rows; ventrals 161–216; subcaudals 47–73 .... *B. atrox*

TABLE XXI. Key to additional species of *Bothrops*—Continued

	(b)	Scales in 21–23 rows; ventrals 156–172; subcaudals 58–64	*B. pulcher*
7.	(a)	Keels on dorsal scales much shorter than scales; scales in 23 rows; ventrals 159–161; subcaudals 52–55	*B. microphthalmus*
	(b)	Keels on dorsal scales extending nearly the length of the scales	8
8.	(a)	Ventrals number more than 160	9
	(b)	Ventrals 149–160; scale rows, 23–25; subcaudals 30–38	*B. ammodytoides*
9.	(a)	Scales in 21–27 rows; ventrals 168–182; subcaudals 41–53	*B. neuwiedii*
	(b)	Scales in 29–35 rows; ventrals 167–188; subcaudals 31–51	*B. alternatus*
10.	(a)	2nd upper labial forming anterior border of loreal pit; scales in 25–27 rows; ventrals 230–253; subcaudals 72–83	*B. castelnaudi*
	(b)	Loreal pit separated from labials	11
11.	(a)	Supraoculars narrow, separated from each other by 7–10 series of scales; dorsal scale rows 23–27; ventrals 121–134; subcaudals 26–36	*B. nummifer*
	(b)	Supraoculars large, separated from each other by 5–7 series of scales	12
12.	(a)	Snout not turned up; rostral not deeper than broad; scales in 21 rows; ventrals 135–142; subcaudals 22–34	*B. godmani*
	(b)	Snout turned up at the end	13
13.	(a)	Rostral $1\frac{1}{3}$–$1\frac{1}{2}$ times as long as broad; scales in 25–27 rows; ventrals 152–159; subcaudals 29–35	*B. lansbergi*
	(b)	Rostral $1\frac{2}{3}$–2 times as deep as broad; scales in 23–25 rows; ventrals 132–150; subcaudals 27–38	*B. brachystoma* (N.B.—Synonym for *B. nasutus*)
14.	(a)	Subcaudals all or greater part in two rows	15
	(b)	Subcaudals all or greater part in a single row	16
15.	(a)	Scales in 27–35 rows; ventrals 198–218; subcaudals 59–71	*B. bilineatus*
	(b)	Scales in 21 rows; ventrals 149–171; subcaudals 41–49; a horn-like scute or scale above eye	*B. undulatus*
16.	(a)	Supraocular shield narrow; scales in 21–23 rows; ventrals 164–171; subcaudals 59–67	17
	(b)	Supraocular shields large	18
17.	(a)	Loreal pit separated from labials; 9 upper labials	*B. lateralis*
	(b)	2nd upper labial forms anterior border of loreal pit; 10 or 11 upper labials	*B. bicolor*
18.	(a)	Supraocular shield separated from eye by a series of pointed scales; dorsal scale rows 19–25; ventrals 138–162; subcaudals 47–62	*B. schlegeli*
	(b)	Supraocular shield borders the eye; dorsal scale rows 19	19

TABLE XXI. Key to additional species of ***Bothrops***—Continued

19.	(a)	5–6 series of scales between supraoculars; ventrals 134–146; subcaudals 49–54	*B. nigriviridis*
	(b)	An enlarged frontal shield; ventrals 154–158; subcaudals 53–61	*B. aurifer*

Some are terrestrial, others are arboreal and all are quite variable in color and pattern. Two keys are provided: table XX was devised by Grocott and Sadler (in "Poisonous Snakes of Panama" 1958) and table XXI was adapted from Boulenger ("Catalogue of Snakes in the British Museum, 1896"). At the time the latter key was first devised, members of this genus belonged to *Lachesis* which has since been restricted to only one species. Many of the species appearing in the key are not covered in Chapter VII, generally because they are rare.

(d) **Genus *Lachesis* (The Bushmaster).** This genus includes but one species and therefore a description of the genus is omitted. However, it may be said, in supplement to the information appearing in Chapter VII, that the bushmaster (*L. muta*) is the world's largest viper and the second largest of all poisonous snakes, being surpassed in length only by the Asiatic king cobra. It reaches a length of up to 12 feet but its average length is about 8 feet. The ovoid head and body scales are characteristically rasp-like due to the tuberculated or raised center of each scale. One of its common names, "la Verrugosa" (the warty one) is derived from this characteristic. It is also known as the "cascabela muda" (the mute rattler) because it has no rattle. This snake is unique among the New World pit vipers in being an egg layer; all other pit vipers produce living young. Otherwise it bears a strong relationship to the genus *Bothrops*. It is widely distributed but rare everywhere, probably due to its egg laying habit.

(e) **Genus *Trimeresurus*** (Asiatic Pit Vipers). This genus of rattle-less pit vipers is, arbitrarily, restricted to Asiatic species. No morphological characters have yet been found to show that the South American species (genus *Bothrops*) are generically distinct from the Asiatic ones. A comparison of the characteristic of the 2 genera will indeed show that they are very closely related if not identical.

All Asiatic members of this group (genus *Trimeresurus*) share the following characteristics (unless otherwise noted in the individual descriptions in Chapter VII):

1. Eye with vertical pupil.
2. Head distinct from neck; triangular or ovoid.
3. Upper surface of head covered with scales or small shields.
4. Deep loreal pit between preoculars and loreal shield.
5. Scales in 17–31 rows; ventrals rounded.
6. Tail moderate or short; some species with prehensile tail.
7. Subcaudals paired or rarely all or some of them single.
8. 2nd upper labial united with the loreal forming the anterior wall of the loreal pit.
9. 2–3 small postoculars.
10. Large anterior chin shields; usually no proper posterior chin shields.
11. Anal entire.

The key to this genus separates the species geographically although there are several species common to two or more areas, indicating widespread distribution. See table XXII.

TABLE XXII. Key to species of ***Trimeresurus*** (Asiatic rattle-less Pit Vipers)

A. **Pacific Islands Species.**

1.	(a)	Dorsal scales smooth; throat scales smooth	2
	(b)	Dorsal scales and throat scales strongly keeled	*T. wagleri*
2.	(a)	Scales in 19–27 rows; ventrals 127–219	3
	(b)	Scales in 33–37 rows; ventrals 222–231; found in Luchu Is.	*T. flavoviridis*

TABLE XXII. Key to species of *Trimeresurus* (Asiatic rattle-less Pit Vipers)—Continued

3.	(a)	Tail prehensile (arboreal species)	8
	(b)	Tail not prehensile (ground dwellers)	4
4.	(a)	Ventrals 127–176	6
	(b)	Ventrals 182–219	5
5.	(a)	Ventrals 182–191; subcaudals 66–77; found in Luchu Is.	*T. elegans*
	(b)	Ventrals 198–219; subcaudals 76–96; found in Formosa	*T. mucrosquamatus*
6.	(a)	Ridge of head from eye to above nostril sharply angular; found in Luchu Is.	*T. okinavensis*
	(b)	Ridge of head from eye to above nostril bluntly angular	7
7.	(a)	Dorsal scales in 19 rows; subcaudals 19–31, paired; found in Borneo	*T. chaseni*
	(b)	Dorsal scales in 21–27 rows; subcaudals 36–62, paired or single; found in Formosa	*T. monticola*
8.	(a)	1st lower labials separated from each other by a pair of scales; nostrils noticeably raised; found in Borneo, Sumatra, Java	*T. puniceus*
	(b)	1st lower labials in contact with each other behind mental; nostrils not noticeably raised	9
9.	(a)	Dorsal scales in 19–21 rows	10
	(b)	Dorsal scales in 25–27 rows; back dark-purplish with or without pale green spots; found in Sumatra	*T. purpureomaculatus*
10.	(a)	Back greenish	11
	(b)	Back dark-purplish brown with or without yellow spots but usually without a yellow or white side stripe; found on Polillo and Patnanongnan Is. of Philippines	*T. halieus*
11.	(a)	Supraoculars narrow	15
	(b)	Supraoculars large	12
12.	(a)	Ventrals less than 175 (162–174)	13
	(b)	Ventrals more than 175 (177–198)	14
13.	(a)	Ventrals 162; found in Djampea Is.	*T. fasciatus*
	(b)	Ventrals 162–174; found in Borneo	*T. sumatranus malcolmi*
14.	(a)	Head shields and scales normally edged in black; found in Borneo, Sumatra, Nias Is.	*T. sumatranus sumatranus*
	(b)	Head shields and scales not edged in black; found in Borneo, Sumatra and Nias Is.	*T. hageni*
15.	(a)	Tail lighter in color than body; ventrals 187–203; subcaudals 66–82; found on Palawan	*T. schultzei*
	(b)	Tail same color or darker than body; ventrals 151–187; subcaudals 52–78	16
16.	(a)	Greenish above	17
	(b)	Bright yellow with darker yellow streak on side; endo of tail reddish-brown; found on Bataan Is., Philippines	*T. macgregori*

TABLE XXII. Key to species of *Trimeresurus* (Asiatic rattle-less Pit Vipers)—Continued

17. (a) Back spotted with brown; barred or uniform; sides usually with yellow flecks on outer (last) row of scales; found on Luzon, Bohol, Mindanao, and Jules Is. Philippines .... *T. flavomaculatus*

(b) Back not spotted with brown; sides with or without a narrow yellow or white line on lowest (outer) row of scales 18

18. (a) 1st upper labials completely separated from nasal shield by sutures; found in Formosa and Hainan Is. .... *T. stejnegeri*

(b) 1st upper labials partly or completely united with nasal shield; upper lip and belly yellowish or greenish; found in Formosa and Hainan Is., Hong Kong, B.C.C. and South China .... *T. albolabris*

B. Former Japanese Empire Species.

1. (a) Tail prehensile, color in life being yellowish-green, green or bluish green above; nostril in a single nasal; scales feebly keeled, in 21 rows 2

(b) Tail not or but slightly prehensile; nostril between two nasals or in a half divided nasal; color in life being brownish with dark brown spots 4

2. (a) 3rd upper labial broadly in contact with the subocular; lateral whitish line on each side of the body 3

(b) 3rd upper labial separated from the subocular by a series of scales; no lateral line on each side of the body .... *T. gramineus kodairai* (Formosa)

3. (a) Without a red line below the lateral whitish line on each side of the body; found in N. Formosa, S. China, Checkiang, Fukien, N. Cangtong .... *T. gramineus stejnegeri*

(b) With a red line below the lateral whitish line on each side of the body; found in Formosa .... *T. gramineus formosensis*

4. (a) 1st lower labial not divided; scales in 21 to 37 rows; 2nd upper labial forms the anterior border of the loreal pit 5

(b) 1st lower labial divided, the separate portions forming a pair of small additional chin shields with its fellow; scales in 17–21 rows; 2nd upper labial separated from the loreal by the prefoveal shield; found in Formosa .... *T. gracilis*

5. (a) Scales in 21–25 rows; canthus rostralis sharp and raised; two series of scales between the labial and subocular; internasals separated by two or three apical scales behind the rostral 6

TABLE XXII. Key to species of *Trimeresurus* (Asiatic rattle-less Pit Vipers)—Continued

	(b)	Scales in 26–30 rows; canthus rostralis obtuse; two series of scales between the labial and the subocular	7
	(c)	Scales in more than 30 rows; canthus rostralis obtuse; only one series of scales between the labials and the subocular; internasals separated by two or three apical scales behind the rostral; 10–13 scales on a line between the supraoculars	8
6.	(a)	Scales between the supraoculars more than 10; ventrals 180–190; subcaudals 65–75; found in the Luchu Is.	*T. elegans*
	(b)	Scales between the supraoculars less than 9; ventrals 125–130; subcaudals 40–50; found on Okinawa and Amamishima in the Luchu Is.	*T. okinavensis*
7.	(a)	Internasal in contact with its fellow behind the rostral; upper labials 10, rarely 9; ventrals 140–155; subcaudals 40–55; about 8 scales between supraoculars; found on Formosa and in Fukien Province in China	*T. monticola orientalis*
	(b)	Internasals separated by two or three scales behind the rostral; upper labials 8–11; ventrals more than 200; subcaudals 60–95; scales between supraoculars 12–18; found in Assam; Formosa; Fukien and Szechwan in China	*T. mucrosquamatus*
8.	(a)	Scales in 31 to 37 rows, 35 being the normal number; ventrals 222 to 234; subcaudals 75–90; found in the Luchu Archipelago	*T. flavoviridis flavoviridis*
	(b)	Scales in 31 rows normally; ventrals 200–214; subcaudals 74–83; found in Takarashima and Luchu Is.	*T. flavoviridis tokarensis*

C. Philippine Island Species.

1.	(a)	Head scales smooth	2
	(b)	Head scales keeled; gular (throat) scales keeled; body scales keeled	4
2.	(a)	Supraocular large; ventrals 187–203; subcaudals 66–82; tail light color	*T. schultzei*
	(b)	Supraocular narrow	3
3.	(a)	Uniform yellow, with dark yellow lateral streak	*T. macgregori*
	(b)	Tail purplish-brown, with or without small yellowish dorsal spots; no lateral yellow or white stripe; tail dark, like body	*T. halieus*
	(c)	Green or bluish above with or without a series of brown spots; a lateral whitish yellow line; ventrals 170–187; tail light colored	*T. flavomaculatus*
	(d)	Green above with a yellow line below eye; a lateral yellow stripe; tail colored like rest of body; ventrals 145–170	*T. gramineus*

TABLE XXII. Key to species of *Trimeresurus* (Asiatic rattle-less Pit Vipers)—Continued

4.	(a)	Scales in 21–25 rows; 10–15 scale rows between supraoculars	*T. wagleri*
	(b)	Scales in 19 rows; 7 scale rows between supraoculars	*T. philippensis*

D. **Malayan Species.**

1.	(a)	Scales on top of head and between the eyes, strongly keeled; green with small red and white spots (young); black spotted and banded with green and yellow (adult)	*T. wagleri*
	(b)	Scales between the eyes smooth or bluntly keeled; color green, brown or blackish	2
2.	(a)	Body green, tail usually red	3
	(b)	Color predominantly brown or blackish	4
3.	(a)	Supraocular shields broad, separated by 4–9 series of scales; ventrals 180–191; lowland snake	*T. sumatranus*
	(b)	Supraoculars narrow or indistinct, separated by 8–13 series of scales; ventrals 150–175; mountain snake	*T. popeorum*
4.	(a)	Snout produced into a flat, bilobed projection; supraoculars often in the form of a tuft of erect, pointed scales; color pale greyish-brown marked with black; rare	*T. puniceus*
	(b)	Snout and supraoculars normally developed	5
5.	(a)	Supraoculars broad, separated by 5–8 series of scales; color brown with large blackish spots; mountain snake	*T. monticola*
	(b)	Supraoculars narrow, separated by 12–15 series of scales; color blackish usually with a pale lateral stripe and sometimes variegated with brown or olive; inhabits the sea shore, especially on coastal islands	*T. purpureomaculatus*

E. **Chinese Species.**

1.	(a)	First upper labial partly (rarely not) separated from nasal by a suture; green (rarely with indistinct blackish cross-bands) above, upper lip and belly yellowish or greenish; found in Fukien, Kwangtung, Hainan, Kwangsi and Hong Kong, B.C.C.	*T. albolabris*
	(b)	First upper labial completely separated from nasal by a suture	2
2.	(a)	No scales present between nasal and scale forming anterior border of pit; scales in 23–25 rows; found in Yunnan, Szechwan, Chekiang, and Fukien	*T. monticola*
	(b)	One or more small scales present (rarely absent in *T. jerdonii* and *T. stejnegeri*) between nasal and scale forming anterior border of pit; scales in 19–29 rows	3

TABLE XXII. Key to species of *Trimeresurus* (Asiatic rattle-less Pit Vipers)—Continued

3.	(a)	Scales in 19–21 (rarely 23) rows; fewer than 190 ventrals	4
	(b)	Scales in 25–29 rows; more than 190 ventrals; found in Fukien, Kwangtung, Kwangsi and Szechwan	*T. mucrosquamatus*
4.	(a)	Uniform green above and below save for a narrow stripe along either side of the belly; found in Kwangsi, Kwangtung, Hainan, Hunan, Fukien, and Chekiang	*T. stejnegeri*
	(b)	An intricate pattern chiefly composed of greenish yellow and black; completely lacks palatine teeth (a unique feature in this genus); found in Yunnan, Szechwan and Hupeh (also in Khasi Hills, Assam, and the North Chin Hills, Burma); predominantly a snake of high mountains	*T. jerdonii*

(2) **Family *Viperidae* (The True Vipers).** This family includes terrestrial, semiaquatic, arboreal and burrowing types, all of which have enlarged solenoglyphic fangs that are encased in tissue sheaths when not in use. They do not have the loreal (sensory) pit so typical of the other family of vipers, the *Crotalidae.* Members of this family may be found in Europe, Africa and Asia but they are absent from Madagascar and the New World. According to Ditmars Africa is the land of origin of the true vipers. Although they are usually described as being nocturnal, some members of the genus *Bitis* and especially members of the genus **Atheris** are to a great extent diurnal.

The family **Viperidae** contains about 10 genera, 8 of which contain important and very poisonous species. The genus *Eristicophis* is so restricted and rare that it is not discussed in this study; however, *Azemiops* includes only one species and is included. The family naturally falls into two groups: (1) having large symmetrical head shields, round pupils and are egg layers (oviparous) and (2) having the head almost covered with small keeled scales, elliptical pupils and are viviparous (bear living young). Both groups possess the typical viperine head—broad, flat and triangular. Group 1 contains the following genera: *Causus, Atractaspis* and *Azemiops.* Group 2 includes: *Aspis, Atheris, Bitis, Echis, Pseudocerastes, Vipera* and *Eristicophis.*

Table XXIII is a key to the identification of the above genera. Keys to the species of the genera are included in the discussion of each.

(a) **Genus *Aspis* (The Asp and Horned Vipers).** This genus is characterized as follows:

1. Head distinct from neck and covered with small juxtaposed or feebly overlapping scales.
2. Eye moderate in size or small with elliptical pupil and separated from labials by small scales.
3. Nostrils directed upwards and outwards, in small single or divided nasals.

TABLE XXIII. Key to the genera of Family *Viperidae*

1.	(a)	Head covered with large symmetrical shields	2
	(b)	Some or all of the head shields broken into small shields or scales; mandibular teeth well developed; eye moderate in size or small with vertical (elliptical) pupil	4

TABLE XXIII. Key to the genera of Family *Viperidae*—Continued

2.	(a)	Mandibular teeth well developed; eye moderate in size	3
	(b)	Mandibular teeth reduced to 2–3; eye minute with round pupils	ATRACTASPIS
3.	(a)	Nostril between 2 nasals and the internasal; pupil round; scales oblique on sides	CAUSUS
	(b)	Nostril in a single nasal; pupil vertical; scales not oblique	AZEMIOPS
4.	(a)	Lateral scales not smaller than dorsals, without serrated keels; subcaudals paired	5
	(b)	Lateral scales smaller than dorsals	7
5.	(a)	Nasals separated from rostral by small scales	6
	(b)	Nasal in contact with rostral or separated only by one naso-rostral shield	VIPERA
6.	(a)	A crescentic supranasal shield	BITIS
	(b)	No supranasal shield	PSEUDOCERASTES
7.	(a)	Scales disposed obliquely with serrated keels	8
	(b)	Scales only slightly oblique, keels not serrated; subcaudals single; tail prehensile	ATHERIS
8.	(a)	Subcaudals paired; ventrals angulate laterally	ASPIS
	(b)	Subcaudals single; ventrals rounded	ECHIS

4. Body cylindrical, scales keeled with apical pits and in 23–35 rows.
5. Dorsal scales form straight longitudinal series with club- or anchor-shaped keels not extending to the posterior end of the scales; lateral scales smaller, oblique and pointing downward with serrated keels.
6. Ventrals have an obtuse keel on each side.
7. Tail short; subcaudals paired.

See Table XXIV for differentiation of the two species. Note that former (but still common) scientific name(s) and the common name is given for each of the species.

TABLE XXIV. Key to species of *Aspis*

Scientific Name	*Aspis eerastes*	*Aspis vipera.*
Former Scientific Name(s)	(*Cerastes cerastes*) (*Cerastes cornutus*)	(*Cerastes vipera.*)
Common Name	Horned Viper	Cleopatra's Asp.
Dorsal Scale Rows	27–35	23–27.
Ventrals	130–165	102–122.
Subcaudals	25–42	18–26.
Total Length	740 mm.	340 mm.
Tail Length	90 mm.	30 mm.
Supraocular "horns"	Yes	No.

(b) **Genus *Atheris* (The Tree or Bush Vipers).** The tree vipers include four distinct species. Prominent characteristics shared by all are as follows: (1) Head very distinct from neck, thickly covered above with small, strongly keeled, imbricate scales; (2) large eyes with vertical pupils; (3) lateral nostrils; (4) keeled scales with apical pits, the laterals more or less oblique and smaller than the dorsals and the outermost lateral row; (5) rounded ventrals, moderately short prehensile tail; (6) single subcaudals; (7) eyes usually separated from labials by smaller scales; (8) upper temporal very short.

Table XXV is a key to the species of this genus.

TABLE XXV. Key to the species of *Atheris* (The Tree or Bush Vipers)

1.	(a)	No horn-like scales above the eye	2
	(b)	Several erect, horn-like scales above the eye (supraciliary scales) 9–10 scales between the eyes; dorsal scales in 25 rows	*A. ceratophorus*
2.	(a)	Gular (throat) scales strongly keeled	3
	(b)	Gular scales smooth or only feebly keeled; has a or A-shaped black marking on top of head from above nostril to above last labial shield; end of tail black or blackish	*A. nitschei*
3.	(a)	9–11 scales between eyes; 25–36 dorsal scale rows	*A. chlorechis*
	(b)	7–8 scales between eyes; 15–25 dorsal scale rows	*A. squamigera*

(c) **Genus *Atractaspis* (The Burrowing Vipers).** The burrowing vipers of Africa (only one species known outside of the African continent) represents the most advanced stage of solenoglyphic fangs. In these animals, the fangs are enormously enlarged and nearly always one or more spare fangs can be found, ready to take the place of a broken or extracted one. Like all *Viperidae* the fangs are encased in a tissue sheath.

Loveridge (1928) stated that they "are so totally different from all the rest in their outline that there is a very real danger in their being mistaken for harmless snakes". Because of their burrowing habit their bodies are slender with heads no broader than their bodies, body scales are smooth and they have very small eyes and poor sight. Like the blind snakes they come to the surface after rains and in traveling over the ground hold their usually sharply pointed heads at a peculiar angle as if ready to dig into the ground at any moment. They are surprisingly quick.

The genus currently includes so many very closely related species that, for the purposes of this study, a key would do no more than compound the confusion admittedly surrounding species identification within this genus. Therefore, table XXVI presents some of the known characteristics of the better known species in tabular form rather than in a key.

It should be noted that *Atractaspis* species are rarely seen in most places but in parts of East Africa (Sudan) one species was reliably reported to be the second most frequent cause of accidents and deaths from snake bite. In addition, it seems that this small snake is quite unique in that it has such disproportionate fangs that it is unable to use the two in unison. The fangs exceed the head in length and when out for blood the snake extends only one at a time at an obtuse angle to the roof of the mouth! (Pitman in "A Guide to the Snakes of Uganda" page 291, 1938).

(d) **Genus *Azemiops*.** This genus includes but one species, *A. feae*, known as Fea's viper. It belongs to that group of vipers in which the head is covered with large symmetrical shields. It is found in upper Burma and a few surrounding territories. A description of this snake will be found in Chapter VII.

(e) **Genus *Bitis* (The Puff Adders of Africa).** Without doubt, *Bitis* is the most spectacular genus of vipers. The eight mostly large species are really frightful looking animals and as dangerous as they look. While the hemotoxin of their venom predominates, it contains as well a powerful neurotoxin. The malevolent stare, large overdeveloped fangs and loud hissing of an aroused *Bitis* species is the personification of deadliness. Some species have horn-like projections on the snout.

TABLE XXVI. Some characteristics of species of *Atractaspis*

Species	Mid-body Dorsal Scale Rows	Ventrals	Subcuadals	Upper Labials	Temporals	Habitat
A. aterrima	19–21	251–300	18–24 S	5	1 Lge Ant.	West and Central Africa.
A. corpulenta	23–27	178–193	23–27 Sp	5	1+3	Liberia to Gabon.
A. irregularis	23–27	220–257	22–29 P	5	1 Lge Ant.	Ghana to Rep. of Congo.
A. dahomeyensis	29–31	223–240	24–27 SP	5	1 Lge Ant.	Dahomey.
A. microlepidota	29–37	212–245	26–37 S	6	2+3 or 4	East and Central Africa.
A. bibronii	21–23	221–260	20–23 S(p)	5	1 Lge Ant.	S. Africa, Angola.
A. leucomelas	23	243	27 S(p)	6	2+3	Somaliland.
A. heterochilus	23	341–353	23	(?)	(?)	East Central Africa.
A. hildebrandtii	17	167–174	22–28 P	6	1 Lge Ant.	East Africa.
A. congica	19–21	200–230	19–23 P(s)	5	1+2	Congo, Angola.
A. micropholis	25	210–215	29–30 S	6	2+3 or 4	Cape Verd.
A. engaddensis	27	264–277	36–39 S	7	(?)	Dead Sea Area, SW Arabia.

N. B.— S—Subcaudals all single; Sp—All or most single; S(p)—Single, sometimes a few paired; SP—partly single, partly paired; P—Subcaudals all paired; P(s)—Paired, sometimes a few single.

TABLE XXVII. Key to species of *Bitis* (The Puff Adders)

1.	(a)	Nostrils directed upwards; no enlarged, raised scales; 1–2 series of scales between the nasal and rostral; dorsal body scales in 29–41 rows	*B. arietans*
	(b)	Nostrils directed upwards and outwards	2
2.	(a)	No enlarged raised scales between the supernasals; 2–3 series of scales between the nasal and rostral; dorsal body scales in 22–31 rows	3
	(b)	Enlarged, more or less raised or horn-like scales between supranasals; 4–5 series of scales between nasals and rostral; dorsal body scales in 33–44 rows	7
3.	(a)	No horn-like scales in the supraocular region	4
	(b)	Supraocular "horns" usually presents; subcaudals, in females, small and scale-like, more or less distinctly keeled	6
4.	(a)	Supraocular region raised but without horn-like scales; subcaudals well developed and smooth in both sexes	*B. inornata*
	(b)	Supraocular region not raised; no horn-like scales; subcaudals well developed and smooth in both sexes	5
5.	(a)	Outer (last) row of scales smooth	*B. peringueyi*
	(b)	Outer (last) row of scales keeled	*B. atropos*
6.	(a)	Several supraocular horns present	*B. cornutus*
	(b)	Supraocular horn, if present, single	*B. caudalis*
7.	(a)	A single enlarged scale above each supranasal, in contact with each other	*B. gabonica*
	(b)	2–3 enlarged scales above the supranasals, usually with small scales between them (i.e., not in contact with each other)	*B. nasicornis*

The broad, flattened head is covered with small keeled scales with apical pits and is conspicuously distinct from the neck. Lateral scales in some species are slightly oblique and the ventrals are rounded. Subcaudals are arranged in two rows. The moderately sized eyes are particularly unpleasant with their elliptical pupil and their pallid golden or silvery color. The body is bloated and in spite of their massive size (compared to their length) and generally sluggish disposition, these snakes exhibit remarkably fast body movement when making an attack. They strike with a lightning-like flash, injecting their poison by a combination strike and bite as do the pit vipers.

Their distribution covers the African continent almost as broadly as that of the cobras. Table XXVII is a key to the species.

(f) Genus *Causus* (The Night Adders of Africa). Confined entirely to Tropical and South Africa, this genus is represented by 4 species. Because they have large symmetrical head shields and thus resemble the non-poisonous snakes, they are unique (together with *Atractaspis*) among the African long-fanged snakes.

Known commonly as night adders, they have round pupils of moderate size, a loreal shield, well developed mandibular teeth, cylindrical bodies, scales that are smooth or keeled, oblique on the sides and have apical pits. The ventrals are rounded, the tail short and subcaudals may be either single or paired. The prevailing coloration is grey to greenish and all are similarly marked with rhomboid or chevron-shaped markings. Two species have upturned snouts, presumably for burrowing. They are partial to lurking in rubbish heaps and in piles of rocks. Table XXVIII is the key to the species.

(g) Genus *Echis* (The Carpet or Saw-scaled Vipers). Represented by 2 species, these small (2.5–3.0 ft) vipers are characterized by having lateral oblique scales with serrated keels which they use to make warning sounds. Each keel has secondary serrations. They are found in Africa north of the equator, Arabia, Syria, Palestine and southern Asia from the Transcaspian area to India.

TABLE XXVIII. Key to species of *Causus* (The Night Adders)

1.	(a)	Dorsal body scales in 17 rows or more; subcaudals all or most in two rows	2
	(b)	Scales in 15 rows; subcaudals single	*C. lichtensteinii*
2.	(a)	Snout turned up at the end and prominent	3
	(b)	Snout obtuse and only moderately prominent; dorsal scale rows 17–21; ventrals 120–155; subcaudals 15–29	*C. rhombeatus*
3.	(a)	Dorsal scale rows, 19–22; ventrals 134–152; subcaudals 17–25	*C. resimus*
	(b)	Dorsal scale rows, 17; ventrals 113–125; subcaudals 10–18	*C. defilippi*

Generic characteristics are as follows: head very distinct from neck; head covered with small overlapping scales; eyes moderate with elliptical pupils, separated from labials by small scales; nostrils directed upwards and outwards, in a single or divided nasal shield; body cylindrical; dorsal scales keeled with apical pits, in 27–37 rows; lateral scales oblique, pointing downwards with serrated keels; ventrals rounded; tail short, subcaudals single.

When excited, *Echis* species have the peculiar habit of arranging their bodies in 2 half-circular loops and rubbing the loops against each other, thereby causing a rasping noise. Many authorities agree that these snakes are very aggressive towards man. They are small and inconspicuous in the sand in which they bury themselves with only their heads exposed. It is found in desert and rocky terrain, fairly close, however, to a source of water. They are mostly nocturnal but has been found during the day far from sources of water. Table XXIX gives a detailed comparison of the specific characteristics of the two species.

TABLE XXIX. Characteristics of *Echis* species (The Carpet or Saw-scaled Vipers)

Character	*E. carinatus*	*E. coloratus*
Dorsal Scale Rows	27–37	31–35.
Ventrals	132–192	174–205.
Subcaudals	21–48	42–52.
Scale Series between Eyes	10–15	13–20.
Scale Series between Eyes and Labials.	2 (1–3)	3–5.
Upper Labials	10–12	12–15.
Supraocular	Present	Not present.
Scales around the Eye	11–20	14–20.
Nostral Shield (Nasal)	In contact with Rostral	Not in contact with Rostral.
Markings	A ⅄-, Y- or Y- shaped mark on head	No such mark.
Coloration	(Both species are colored pale buff, greyish, reddish, or brown above, with 1–3 series of whitish dark-edged spots).	
Total Length	720 mm.	750 mm.
Tail length	70 mm.	80mm.
Distribution	Desert or sandy regions from N. Africa to India.	Palestine, Arabia, Socotra Is.

(h) **Genus *Pseudocerastes* (Horned Desert Vipers).** This genus of desert vipers is also represented by only two species, both of which have supraocular horns. The possession of horns separates them from *Echis* which they resemble superficially.

The generic characteristics shared by the two species are: (1) head very distinct from neck, covered with small imbricate scales; (2) eyes small with vertical pupil, separated from labials by small scales; (3) nostrils directed upwards and outwards, pierced between two small nasals—a large cresentic anterior one and a small scale-like posterior one; (4) nasals separated from rostral by small scales; (5) body cylindrical, scales keeled, in 23–25 rows, the keels club-shaped and not extending to the end of the scale; (6) ventrals rounded, tail moderate, subcaudals paired.

The specific characteristics of the two species is presented in Table XXX.

TABLE XXX. Characteristics of *Pseudocerastes* species

Character	*P. fieldii*	*P. persicus*
Dorsal Scale Rows	17–25	23–25.
Ventrals	134	151–156.
Subcaudals	35	43–49.
Scale Series between Eyes	10	(?).
Scale Series between Eyes and Labials.	2	3.
Upper Labials	13	13.
Scales around Eyes	15–18	15.
Total Length	750 mm.	890 mm.
Tail Length	80 mm.	110 mm.
Coloration	Pale yellowish grey with indistinct darker transverse bars on back and a row of smaller dark spots at the sides. Venter (anal) usually light yellowish grey. Side of head darker brown behind the eye. Tip of tail black.	Greyish or brownish above, with four series of large dark spots, the two median sometimes confluent and forming cross-bars; a dark streak on each side of head from eye to behind gape; whitish beneath, dotted with dark, and with a lateral series of dark spots.
Distribution	Sinai, Transjordan and the Southern Negev Desert.	Persia.

(i) Genus *Vipera* (The European Viper and Related Species). Represented by about 10 species (many of which have several identifiable sub-species), members of this genus are widely distributed in Europe, North Africa, the Near and Middle East and Central and Eastern Asia. One species is found as far north as 67°N (and in Finland perhaps to about 69°N.) in Europe and as far east as Sakalin Island in the Pacific (*V. berus*).

Characteristics shared by all species are as follows: (1) head distinct from neck, covered with small scales with or without small frontal and parietal shields; (2) eyes moderate or small, with vertical pupil, separated from labials by scales; (3) nostrils lateral; (4) nasal in contact with rostal or separated by a naso-rostral shield; (5) body cylindrical; (6) scales keeled, with apical pits, in 19–31 rows; (7) ventrals rounded, tail short, anal entire, subcaudals in two rows; (8) typical solenoglyphic fangs in tissue sheath; (9) no sensory pit between nostril and eyes.

Because many of the species have several sub-species, a description of the most common of which appears in Chapter VII, only the species description of those having sub-species are described in this section. Table XXXI is a key to the species. Separate keys to the sub-species follow the descriptions given in subsequent paragraphs.

(1) Vipera *ursinii* (Ursini's Viper). There are 3 sub-species, a key to which is given as table XXXII. Common characters are given in the key to species (table XXXI). They are found in southeast France, central Italy, Hungary, Yugoslavia, Romania, Bulgaria, Northern Albania and from the Danube delta basin to Turkestan and Central Asia. A characteristic of this species (except *kaznakovi*) is the absence of red pigment. On the whole this species is smaller than *V. berus;* the head is sharper and generally has a single apical scale. Fangs are small, projecting little from the sheath. The dorsal pattern always has a laterally defined light background (not found in *V. berus*).

TABLE XXXI. Key to species of *Vipera*

1.	(a)	Supraocular shield large, bordering the eye; scales on crown and snout smooth or faintly keeled; nostril in a single or irregularly divided nasal, which is separated from the rostral by a naso-rostral; scales in 19–23 rows (very rarely 25) ; ventrals 120–169	2
	(b)	Supraocular shield moderately large or narrow, not erectile, or broken up into scales; upper surface of head covered with small, imbricate, usually keeled scales; scales in 23–31 rows; ventrals 142–180	5
2.	(a)	Snout not turned up at the end; supraocular usually extending posteriorly beyond the vertical of the posterior border of the eye; frontal and parietal shields usually well developed; usually a single series of scales between the eye and the labials, rarely two	3
	(b)	Snout usually more or less turned up at the end or produced in a scaly dermal appendage; supraocular not extending posteriorly beyond the vertical of the posterior border of the eye; crown usually covered with small scales, frontal and parietals, however, sometimes well developed; two or three series of scales between the eye and the labials; 9–13 upper labials; scales in 21–23 rows, rarely 19 or 25	4

TABLE XXXI. Key to species of *Vipera*—Continued

3. (a) Snout obtusely pointed, flat above, or with the canthus slightly raised; rostral usually in contact with a single apical scale, rarely with two; 6–9 upper labials, usually 7–8; scales in 19 rows; rarely 21; ventrals 120–150; ocular ring of scales always single; dark dorsal pattern on light background .... *V. ursinii*
(See table XXXII)

(b) Snout truncate or broadly rounded, flat above or with very slightly raised canthus; rostral in contact with two apical scales, rarely with one; scales in 21 rows, rarely 19 or 23; ventrals 132–158; ground color variable, usually with more or less brown .... *V. berus*
(See Table XXXIII)

4. (a) Snout simply turned up, the raised portion bearing two or three apical scales; ocular ring of scales always double; a pattern of ocelli, or a wavy spinal line down the back; rostral not more than once and a half as deep as broad; ventrals 134–169 .... *V. aspis**

(b) Snout produced in an appendage covered with 10–20 scales; rostral not deeper than broad; ventrals 133–162; canthus distinct; head has shields present only exceptionally and in the young; usually only small keeled scales on head; ocular ring of scales always double .... *V. ammodytes*
(See Table XXXIV)

5. (a) Supranasal shield present 6

(b) No supranasal; nostril pierced between two nasals, the anterior one in contact with the rostral; scales in 27 rows .... *V. superciliaris*

6. (a) Scales in 23–27 rows; supranasal usually not bordering the nostril; head with small, always keeled scales; supraocular whole or divided; supranasal present .... *V. lebetina*
(See Table XXXV)

(b) Scales in 27–33 rows; supranasal bordering the nostril .... *V. russelli*

*This is Hugy's viper and appears in some classifications as *Vipera aspis hugyi.*

TABLE XXXII. Key to sub-species of *V. Ursinii* (Ursini's Viper)

1. (a) Scales usually in 19 rows; ground color grey or yellowish grey 2

(b) Scales usually in 21 rows 3

2. (a) Head narrow; diameter of eye smaller than its distance from mouth; throat white, at most the posterior lower labials have a black margin .... *V. u. ursinii*

(b) Head short; diameter of eye as great or greater than its distance from mouth; scales between eye and upper labials very narrow; scales of throat and lower labials have a black margin .... *V. u. macrops*

TABLE XXXII. Key to sub-species of *V. Ursinni* (Ursini's Viper)—Continued

3.	(a)	Head pointed; apical scale usually single (unbroken); ground color usually grey or yellowish grey; lower side more or less variegated with black	*V. u. renardi**
	(b)	Head very short and rounded; apical scales absent or variable, single or divided; a distinct zigzag band down the back; males grey, females brown	*V. u. kaznakovi*

*Some authors believe that this snake is sufficiently distinct to deserve species, rather than sub-species, rank.

TABLE XXXIII. Key to sub-species of *V. Berus* (Common European Viper)

1.	(a)	Ocular ring of scales usually single	2
	(b)	Ocular ring, as a rule, wholly or partially double; has a tendency to splitting up of head shields; canthus distinctly raised; males almost never grey; zig-zag band with a tendency to break up into transverse bars	*V. b. bosniensis*
2.	(a)	Canthus not raised; head shields as a rule, normal, not broken up; a distinct zig-zag band down back; males usually grey, females usually brown	*V. b. berus*
	(b)	Canthus raised; head shields with a strong tendency to splitting up; zig-zag band down back frequently indistinct and, if so, reduced to a spinal line with an indistinct lateral margin and with a pale line accompanying it on each side	*V. b. seoanei*

(2) Vipera *berus* (Common European or Cross Adder). There are 8 sub-species: (1) *V. b. bosniensis* (the Balkan Cross Adder) which is essentially restricted to the northwestern part of the Balkan peninsula and reaches the northern part of Albania. The ground color is always browner than *berus* and the snout is broader. (2) *V. b. seoanei* (the Iberian Cross Adder) which is found only in the extreme north and northwest of the Iberian peninsula from the Basque provinces, across the mountains to Old Castille. It is not found below 2400 feet altitude and does not occur farther south than the Rio Lima. It never occurs in the same locality with *V. a. latastei.* (3) *V. b. berus* is undoubtedly one of the most widespread poison snakes in the world. Only *Pelamis platurus* is more widely distributed.

It is found throughout Europe, Scandinavia, European Russia, Central Asia and as far east as Sakalin Island in the Pacific. It is known to occur as far north as "the weather will allow". Table XXXIII is a key to the sub-species.

(3) Vipera *ammodytes* (the Sand vipers). There are 5 to 7 sub-species, depending upon whose classification is used. They occur in Italy, France, part of Spain, Switzerland, Sicily, Yugoslavia, Albania, Romania, Bulgaria, Greece and Asia Minor.

Common characteristics of the species are: (1) head triangular, rather pointed; (2) canthus strongly raised, snout formed into at least a point, mostly a horn; (3) ocular ring double; (4) apical scale divide into two; (5) head covered, usually with several small keeled scales, only exceptionally or in the young do shield occur.

Table XXXIV is the key to sub-species.

(4) Vipera *lebetina* (the Mountain and Desert Adders). Again, there are 5 or more sub-species depending upon whose classification is used. They occur throughout North Africa from Algeria east; most of Asia Minor and crosses the Bosporus into Greece a short distance; in the Transcaucasian area (Aras and Kura) and transcaspia, West Turkestan with the easternmost extension being the Pir-Panjal Pass in Kashmir.

Common characteristics are: (1) A large species, females larger than males, no horn, no shields, fangs large; (2) ground color grey, grey-brown, or yellowish with grey underside in males, lighter grey to yellow underside in females; (3) pattern consisting of rosettes with light centers, the intensity of the margination of which may merge into a wavy band; lateral spots more distinct than dorsal pattern; up to 1600 mm long.

Table XXXV is the key to the sub-species.

TABLE XXXIV. Key to sub-species of *V. Ammodytes* (The Sand Viper)

1.	(a)	Rostral just raised above rostral margin; tip of rostrum slightly, but distinctly, bent upwards; pattern on back consisting of narrower, or broader, alternating, nearly rectangular spots that rarely fuse to form crossbars or a zig-zag band; ground color red to reddish yellow to reddish brown	*V. a. aspis**
	(b)	Rostral projecting very strongly beyond rostral margin	2
2.	(a)	Horn with anterior surface formed only by rostral; apical scales just visible; has a zig-zag band down back	*V. a. latastei*
	(b)	Horn elongated, fleshy, its anterior surface formed by rostral, at least 2 canthals and apical scales	3
3.	(a)	Canthals not touching above rostral; rostral usually divided into a lower part which remains below the level of the rostral margin, and an upper part which may consist of separate shields; horn oblique; tip of tail coral red; a zig-zag band present	*V. a. ammodytes*
	(b)	Canthals touching above rostral; rostral projecting beyond level of rostral margin but never divided or broken; tip of tail green	4
4.	(a)	Horn longer; at least 2 median scales above the canthals immediately behind horn; a zig-zag band present	*V. a. meridionalis*
	(b)	Horn shorter; no median scale above canthals except terminal one; pattern consisting of alternating transverse spots and bars	*V. a. transcaucasiana*

*This snake is the European asp and some herpetologists prefer to give it specific rank, calling it *V. aspis aspis*. Hugy's viper, referred to in table XXXI is given sub-species rank and called *V. aspis hugyi*.

TABLE XXXV. Key to sub-species of *V. Lebetina* (The Mountain and Desert Adders)

1.	(a)	Scales in 23 rows; supraocular not divided; ocular ring double	2
	(b)	Scales in 25–27 rows; supraocular usually partially or completely split into 3 scales; ocular ring consisting of 3 rows	3
2.	(a)	Supraocular small; no scales between it and the eye; ground color yellow to golden brown; pattern consisting of ocelli with black or white margins or of a wavy spinal line	*V. l. xanthina**
	(b)	Supraocular very broad; a few small scales between it and the eye; ground color sandy; ocelli with bright reddish-yellow center	*V. l. raddei***

TABLE XXXV. Key to sub-species of *V. Lebetina* (The Mountain and Desert Adders)—Continued

3.	(a)	Ground color sandy; pattern indistinct	4
	(b)	Pattern distinctly black on a pale background; ocelli or a wavy spinal band present; head pointed	*V. l. mauritanica*
4.	(a)	Head pointed; scales on head keeled; pattern quite indistinct	*V. l. lebetina*
	(b)	Head short, blunt; scales on head not keeled; pattern of pale ocelli	*V. l. deserti*

*This snake is sometimes given specific rank with two sub-species: *V. xanthina palaestinae*, and *V. xanthina euphratica*. A description of both *V. l. xanthina* and *V. xanthina palaestinae* will be found in Chapter VII; however, the classification of this group is as yet unsettled. The generic description of *V. lebetina* will serve to identify any of these snakes sufficiently well to determine proper serum therapy.

**This snake is also given specific rank in some classifications.

5. HABITAT AND HABITS

a. North American Poisonous Snakes.

(1) **The rattlesnakes** (genus *Crotalus* and *Sistrurus*) may be found in practically any type of terrain, but they prefer open, sandy places or rocky ledges. They do not always give a warning rattle. When surprised, they may strike first and rattle afterward; some hardly can be induced to sound off under any circumstances. Most rattlesnakes will nearly always try to escape without a fight; however, there is always the chance that a snake may strike at a passerby.

(2) **The water moccasin** (genus *Agkistrodon*) lives in or near water and is a good swimmer. Often it is seen on logs or leaning trees in swamps; it is fond of basking on branches and logs along sluggish streams, bayous and swamps. The snake usually will retreat when disturbed but it may stand its ground, holding its mouth wide open in a threatening manner. For this reason, it is sometimes called a "cotton mouth", "gapper" or "trapjaw".

(3) **Copperheads** (also genus *Agkistrodon*), in the southern regions of the U.S., may be found on dry ground almost anywhere in the fields or woods. In the northern areas, it is usually found in thick forests. These snakes are rather timid; they usually stay hidden and try to escape when discovered. If cornered, they may vibrate the tail and produce a distinct buzzing sound in vegetation. Even where they are quite numerous, bites seldom occur because of the timidity and secretiveness of these snakes.

(4) **Coral snakes** (genus *Micrurus*) burrow in the ground and seldom are seen. However, they do come out and move around in the early morning or on rainy days. The coral snake is not vicious and will bite only if stepped on or handled. Bites are rare, but the poison is deadly.

b. Central and South American Poisonous Snakes.

(1) **Rattlesnakes** (genus *Agkistrodon*) in this area are represented by five species, only one of which is widely distributed. Like its North American cousins, this snake, the tropical rattlesnake (*Crotalus terrificus*) prefers sandy places and rocky ledges in dry hilly country. It is large and aggressive and may strike with very little warning and before coiling. If teased it may advance toward the tormentor.

(2) **Bushmaster** (genus *Lachesis*) is now restricted to only one species, *Lachesis muta*. This large snake is found mostly in forests at low altitudes. It prefers dry ground and often hides in animal burrows. When lying on the forest floor its camouflage is hard to see. The snake may either remain motionless until touched or it may attempt to escape when cornered. It may strike viciously; sometimes it may even edge towards an intruder. The tail is vibrated when the snake is irritated and if it rattles the dry leaves, the snake may be mistaken for a rattlesnake. The bushmaster is a savage and dangerous snake but it is seldom seen.

(3) The **Fer-De-Lance** Group (genus *Bothrops*) is widespread throughout Central and South America. The large species are ground

snakes; some of the smaller species, known as palm vipers, live in trees especially at the base of the leaves of a palm tree. The larger snakes are dangerous. They may be common in certain areas and are found often in cane fields or around dwellings where they come to catch rats. These snakes loop their bodies before striking.

(4) **Coral Snakes** (genus *Micrurus*) can be found in almost every type of terrain. However, they live mostly underground and have a lazy and gentle disposition. Coral snakes do not coil and strike in the manner of the pit vipers; they remain flat on the ground and bite by twisting the head to one side if they are picked up or stepped on.

(5) **Sea Snakes** (genus *Pelamis*) are represented by only one species in American waters, the yellow-bellied sea snake, *Pelamis platurus*. This snake is found only in salt water and occurs on the Pacific Coast from the Gulf of California to Ecuador. It is sometimes very abundant in the Gulf of Panama. It is not found in the Atlantic Ocean. The sea snake is found in salt or brackish water near the coast. Its bite is dangerous but very rare in this part of the world. Occasionally one may be caught in a fishing net; it should be carefully discarded. The snake has not been known to attack a man swimming, but when their presence is known, such snakes should be given the widest latitude.

c. **European Poisonous Snakes.**

(1) The **vipers** (genus *Vipera*) are the only poisonous snakes in Europe. Some 8 species are known. They are generally found in the wilder areas, particularly in rocky places, such as the Pyrenees, Appenines and Balkan mountains, where they may be found up to 5,000 feet. They occur as far north as 67° N. in Scandinavia. Mountain slopes, moors, grain fields and trash piles are favored as haunts. Some of the European vipers are aggressive and, at times, savage.

d. **USSR Poisonous Snakes.**

Recent information on the poisonous snakes of the USSR is sketchy and for some regions no information at all is available. There are at least five species or sub-species of the true vipers, two of the pit vipers and a species of cobra known to inhabit parts of the USSR. Without specific information it is reasonable to assume that, in the main, the habitat and habits of these snakes resemble closely those of the same species found in geographic areas bordering the USSR. The following is a list of the species known to be found in the USSR:

(1) Family ***Viperidae.***

(a) *Vipera berus berus.* This common viper is found in European Russia, the Caucasus and Transcaucasian areas, all of Turkestan and all of Siberia except the extreme north (not found above 67° N.).

(b) *Vipera lebetina raddei.* This snake is found from Turkmen SSR (especially in Yerevan) to Bukhara.

(c) *Vipera ursinii renardi.* Renard's viper is found in the Caucasus and in Turkestan (often in Semirech'e).

(d) *Echis carinatus.* The saw scaled viper is found in the Transcaspian area, frequently in Turkmen SSR.

(e) *Pseudocerastes persicus.* This viper is found in the southern part of the Transcaspian region.

(2) Family ***Crotalidae.***

(a) *Agkistrodon halys.* This pit viper is called "shchitomordnik" (scaly snout) and is found in the entire Turkestan area, including both high and low grounds, eastern Transcaucasia, from the lower Volga through southern Siberia, including all of Central Asia. The type species, *A. h. halys* is found on the Kirghiz steppes and in Tiran, east to Balkhash.

(b) *Agkistrodon halys intermedius.* This far eastern pit viper is found in Southern Siberia from Semerichenskaya region inclusive to Manchuria and Central Asia.

(3) Family ***Elapidae.***

(a) ***Naja naja.*** This cobra is called "ochkovaya zmeya" (bespectacled snake, kobra) and is found in the southern part of the Transcaspian region, Georgia, Turkmen SSR and all of southern Asia from the Transcaspian area through India. In the Transcaspian region, Afghanistan and northwest India there is a sub-species, *Naja naja oxiana*, which is distinguished from the typical form by the absence of the characteristic design of the spectacles on the hood.

The habits and typical habitats of these snakes are described for the same species in the sections on the poisonous snakes of Africa, the Near East, Europe and Southeast Asia, elsewhere in this study.

e. **The Poisonous Snakes of Africa.**

Because the environment of Africa is so diverse, generalized statements regarding habitat on a family basis would unavoidably be incorrect for some of the species. Therefore, the habitat and habits of each of the major genera are included herein.

(1) **Family *Colubridae.***

Only two species are sufficiently dangerous to warrant inclusion in this study, both of which are mainly arboreal.

(a) *Dispholidus typus.* The widely feared "boomslang" is highly arboreal and therefore is restricted to those areas in which there are suitable trees; however, it is not found in the rain forest. In fact, its distribution completely circumscribes the rain forest (see Chapter VII). This snake has an occasional fit of anger and inflates his skin by a large intake of air into his expanding throat. When so excited he may attack man, but generally it is placid and amiable in disposition. It is not aggressive and rarely attempts to bite unless roughly handled. In water, to which it takes readily, this snake is a powerful, graceful swimmer. Fitzsimons (1932) claimed that the poison of the boomslang speedily kills the puff adder and that, weight for weight its venom was equal in toxic power to that of the cobra. Humans bitten by this snake exhibit hemorrhagic or hemotoxic signs and symptoms similar to the effect of the *Viperidae.*

(b) *Thelotornis kirtlandi.* Unlike the boomslang which it resembles the vine or twig or bird snake is found in the rain forest but it has an even wider range in the savannah country. It is also quite common in localities in which there are rocky outcrops and, although expertly arboreal, it is plentiful on the ground in some areas. This snake also demonstrates its anger by distending its throat and to a certain extent the entire anterior one third of its body. It derives its popular name from its habit of simulating slender branches or vines. It often gets into the most extraordinary attitudes and when along or entwined round the branch of a tree it may extend its head and about a foot of the body rigid and immovable for lengthy periods paying no attention to human beings passing within a few feet. On such occasions, short of killing it, little seems to disturb it. Despite its name, the "bird" snake shows a preference for lizards and other snakes but it does feed on small birds. Its brilliantly colored tongue is used as a decoy in capturing its food.

(2) **Family *Elapidae.***

(a) **Genus *Boulengerina.*** Known as the water cobras, these snakes have a glossy appearance, due undoubtedly to their aquatic mode of life. They do not show any tendency to develop an oar-like tail, so typical of the sea snakes. Identification is made easy by the conspicuous and characteristic black annulations which encircle their body. They are believed to feed exclusively on fish. When irritated, these snakes spread a hood which is not as broad as species of *Naja* of the same size. It is apparently found most frequently basking on rocks bordering quiet rivers or lakes shortly after sun-up. Within an hour or two after sun-up they take to the water in search of fish. These snakes may be confused with the opisthoglyph genus *Grayia.*

(b) **Genus *Dendroaspis.*** The snakes of this genus are known as "mambas" and they are the most dreaded of all African snakes on account of their particularly deadly venom, their aggressiveness and their amazing quickness. They are all very arboreal in habits and, according to species, have a wide range, being found throughout the rain forest, the dry woodland, and the bush country, usually at altitudes between sea level and 5,000 feet. The genus embraces tropical Africa outside the limits of the Sahara from Gambia and Sierra Leone to Ethiopia and Somalia, thence southward throughout the continent to the Transvaal and Natal. Actual pursuit of humans and attacks are indicated to be largely limited to the breeding grounds, during the specific mating season, which also applies to the king cobra. During the balance of the year the average mamba, unless cornered, cautiously glides away from human beings. Mambas are more commonly observed in bushes or low trees where they watch for birds but often come to the ground in search of small rodents. In such locations the gliding rush of large specimens is startling and bewildering and under such conditions interference may be dangerous. In striking, they laterally double back the neck and anterior body so that a lunge may carry the head up to forty percent of the length of the body. Anterior ribs are slightly elongated in the mambas and they may expand or flatten the neck to a slight extent when they are intently watching something or nervously alert and stirred to anger. Mambas have an unpleasant habit of entering houses in the outlying areas in search of rats.

(c) **Genus *Elapsoidea.*** This is the genus of African "garter" snakes; however, some of the more brilliantly colored specimens are called "coral" snakes. They are in no way similar to the familiar non-poisonous garter snakes of the U.S. The genus includes a few species of small short tailed, viper-like snakes approximately 2 feet in length and range around the rain forest from the Southern Sudan to the river Zambezi of South Africa and from Ghana to Kenya at altitudes from sea level to 7,000 feet. Where they occur they are apt to be plentiful if not abundant and are most commonly found in the savannah and light woodland during the rainy season. Members of this genus are inoffensive with an inclination to burrow, thus resembling the genus *Atractaspis* in this respect. They are not inclined to bite unless restrained or injured. Areas in or around rubbish heaps in cleared land or in the forest may harbor these snakes.

(d) **Genus *Hemachates.*** This genus includes only one species, *Hemachates haemachatus*, the South African spitting cobra or "ringhals" (Dutch for "ring-neck"). It is ebony black ventrally with one or two white or yellowish white bars on its throat, thus its name—ringhals. Its fangs are highly evolved for spitting but the ringhals will never bite deliberately as a puff adder will do. It bites only in self-defense and even then only when it is stepped on or injured in some way. Its fangs and venom are used in capturing prey. If a ringhals is met in the open, it will immediately rear up, spread its hood and adapt an attitude of aggressive defiance. If approached a little nearer the snake will lunge forward and eject a spray of venom, aimed at the tormentors eyes (effective from a distance of 4–5 feet). However, the ringhals apparently does not see very well and can detect only moving objects and the danger from this snake comes when people stoop toward the ground or rock pile where alert ringhals may be lying. When its "bluff" is called, it will hurriedly try to escape or sham death by curling the front half of its body over and lying deathly still. It is interesting to note that this same act is performed by the non-poisonous American hog-nosed snake. Juveniles of the ringhals exhibit all of the characteristics of the adults except they will not sham death. This snake is equally at home on the coastal plains or on the tops of fairly high mountains. The bite of the ringhals is as deadly as that of any other cobra.

(e) **Genus *Naja.*** This is the genus of the true cobras of which at least 8 full species occur in Africa. Cobras generally prefer hot, dry territory in which water is plentiful; however, some species may be found in almost any climate or altitude up to 7,500 feet (rare above 5,000 feet). On the whole the representatives of this genus are large, somewhat massive, snakes in which the average size of several species is six feet. Despite their massive character, the cobras are speedy, agile and active, and in addition are apt to be inquisitive and insolent. They are extremely intelligent. Although it is not a general observation, it cannot be denied that certain of the African species can on occasion be decidedly aggressive. If an irritated cobra, with its anterior portion reared up in a menacing posture, is closely observed, venom may be noticed as a dribbling or spilling almost frothing at the jaws. After the strike, cobras hang on and "chew" on the bitten area, at the same time squirting into their victims a succession of discharges of poison. Cobra venom is mainly neurotoxic in action, and therefore these snakes subsist mainly on cold-blooded prey. They will, however, consume freely small rodents and chicks and occasionally they will take hen's eggs. Cobras are decidedly cannibalistic and do not hesitate to devour other species of snakes, particularly species of *Psammophis* (grass snakes), *Trimerorhinus* (the "schaapstekers"—Dutch for "sheepstickers") and sometimes the puff adder (*Bitis arietans*). When hunting for food cobras are often attracted to the vicinity of human habitation and it is therefore surprising that there are not more fatalities from bites by these snakes. In fact, one author several years ago reported that " . . . in 25½ years spent in Egypt and the Sudan, I met no instance of the death of a human being having been caused by a cobra" (quoted from Pittman, C. R. S. "Snakes of Uganda", 1938). Several species of cobras are known occasionally to resort to spitting of venom as a means of defense, particularly, the black-necked "spitting" cobra (*N. nigricollis*). Cobras are expert swimmers and some of them are fond of basking in the sun on the water, partly supported by water plants, with their hood expanded. The hood of most African cobras is not nearly so pronounced as in the Indian cobra (*N. naja*).

(3) **Family *Hydrophidae*.**

This is the family of the sea snakes that live in the tropical parts of the Indian and Pacific Oceans. They occur along the coasts from East Africa to Asia and across the Pacific to the west coast of North and South America from Lower California to Equador. They are not found in or on the coasts of the Atlantic Ocean. Except for one truly "ocean-going" (pelagic) species (*Pelamis platurus*) which ranges to East Africa and to the west coast of the Americas, they are practically limited to the Indian and western Pacific from the Gulf of Persia to southern Japan to the coast of tropical Australia and the islands of Oceania.

(4) **Family *Viperidae*.**

Several species, known collectively as the true vipers, are included in this family. They are all venomous and, in Africa, may be found in a terrestrial, arboreal and even semiaquatic environment. They are widely distributed throughout the continent.

(a) **Genus *Aspis*.** This genus, together with the genus *Echis*, are known as the sand vipers and they are admirably adapted for life in the dry desert areas of North Africa. Ribs of these snakes are capable of flattening the body and there is a muscular arrangement that permits the snake to use the sharp edges of its flattened body to shovel sand over its back by a sort of wavy motion that permits the body of the snake to sink quickly into the sand where it lies with the top of its head protruding. The eyes are on the top of the head and are the same color as the sand, so the snake cannot readily be seen. The two species of this genus resemble the horned vipers of South Africa (genus *Bitis*) in habits but their ranges are widely separated and there are several structural features to distinguish them. *A. cornutus*, for example, has a sharp spine over each eye (supraocular) but this is lacking in *A. vipera*.

(b) **Genus *Atheris*.** This is a genus of curious tree vipers which is restricted to tropical Africa. They are slender-bodied, wide-headed serpents which, because of their protective (green) coloration, are difficult to detect in the leavy environment in which they are found. When disturbed, they remain motionless, hoping thereby to escape detection. Ditmars (1931) described these snakes thus: "They are leaf-green, barely a yard long and live in low trees or bushes. They appear to occur along mountain ranges. They may strike in defense, but seem more commonly to try tactics to escape observation and stiffen the neck at odd angles in an endeavor to imitate a twig. In these maneuvers they simulate the actions of the walking stick." Not much is known of the venom of these arboreal snakes, but it is believed to contain a fairly powerful neurotoxin in order to deal swiftly with the cold-blooded prey upon which these snakes, to a large extent, subsist. They resemble the genus *Bitis* in that the head is covered with strongly keeled scales rather than shields. In one species, there are several erect, small, horn-like scales above the nostrils—a characteristic also shared with certain species of *Bitis*.

(c) **Genus *Atractaspis*.** The members of this burrowing group of vipers, according to Loveridge (1928), are so totally different from other vipers, that there is a real danger of their being mistaken for harmless snakes. An examination of the snakes mouth, however, reveals large or enormously developed poison fangs. They have small eyes and poor sight, and small fangs would seem to be better suited for their way of life. The reason for the presence of such overdeveloped fangs is not understood; however, they are quick to use their fangs if molested and their poison is highly toxic. The mode of traveling on the ground is a unique characteristic of these snakes. They emerge from the ground after rains and hold the snout at a peculiar angle, as if ready to dig down into the soil on a moment's notice. They are surprisingly quick, but the fangs are so enormously disproportinate that they are unable to use both in unison.

(d) **Genus *Bitis*.** This genus, according to Ditmars (p. 177 of "Snakes of the World"), includes 8 mostly large species and is the most spectacular genus of the *Viperidae*. Its members are really frightful looking reptiles and as dangerous as they look. They are, to a degree, diurnal (most active during daylight) and their distribution covers the continent almost as broadly as the cobras. The vipers of north Africa are similar to those of Europe except for the puff adder (*B. arietans*). This snake prefers open forests or grass lands near streams. Its common name is well chosen since, when it wishes to frighten away an unwelcome intruder, it begins to puff itself out swelling visibly as it inflates. Then the process of deflation is accompanied by a loud hiss. They apparently have a large lung capacity. Although sluggish in disposition, these massive (up to five feet long and 15 inches in girth) reptiles exhibit remarkable agility in body movement when making an attack. Most species of *Bitis* are ground-frequenting, besides being extremely partial to water and swimming with ease. Puff adders frequent human habitations in order to feed on rats. The venom is both hemotoxic and neurotoxic and movement or physical activity effectively circulates the poison via the blood stream and should be severely restricted. In case of viper poisoning the administration of alcohol even in small quantities is *absolutely fatal.* The rhinocerous viper (*Bitis nasicornis*), so named because of the pair of horny scales jutting from its nose, with its wicked-looking head and the brilliant colors which cover its stout, ponderous body, is a most astonishing creature. One would expect the bright colors to make the snake very conspicuous but on the contrary, they render the serpent almost invisible in the swampy regions near streams, particularly when its scales are caked with mud. Its partially aquatic habits are responsible for one of its other common names, the riverjack. The food habits are not known completely but presumably the food supply includes fish, toads and frogs in addition to the usual viperine diet of rodents. It is practically confined to the rain forest.

The Gaboon viper (*Bitis gabonica*) is also a forest species, particularly prevalent near streams and other sources of water. It sometimes reaches the size of a man's thigh in girth and up to about 6 feet in length. Its diet is chiefly mammalian (rats, small birds, squirrels) although toads and frogs are consumed freely by this viper. Its prey are killed almost instantaneously by injections of venom driven deeply by long fangs. The venom of this serpent also contains a powerful neurotoxin. Antivenom against puff adder venom exerts practically no neutralizing action on Gaboon viper venom.

The horned adders (*B. cornuta, B. caudalis*) have one or more horn-like scales over the eyes, hence their common name. They are no more than a foot and a half long, but are extremely dangerous in spite of their small size, owing to their habit of burying themselves in the sand with only the head above, where they lie for hours watching for lizards and other small creatures on which they feed. They bite instantly at the bare feet of any native who may come near them and they are practically invisible when buried in the sand. They occur only in the sandy regions of the southern part of Africa.

The berg adder (*B. atropos*) lives upon the mountain ranges throughout South Africa. It devours lizards and the young of ground-nesting birds, insect larvae and mice and rats. It is highly venomous.

(e) **Genus *Causus*.** This genus is another group of vipers which are known as night adders. One species (*C. rhombeatus*) is known as the cape viper. The members of this genus resemble the non-poisonous snakes (*Colubridae*) because the head is but moderately distinct from the neck and they lay eggs. Thus, together with the burrowing vipers (*Atractaspis sp.*) they are unique among the African long fanged snakes. Although by no means the rule these vipers often have a very definite association with damp localities, due probably to their preying largely on frogs and toads. In this selection of cold blooded prey, they differ from most members of the viper family. These snakes are found at altitudes varying from sea level to about 7,000 feet and they show a partiality to lurking in rubbish heaps and in piles of rock. As their common name indicates, they are nocturnal and they are widely distributed in tropical and South Africa. The genus is remarkable on account of the elongated poison glands which reach back several inches into the body cavity. This characteristic is shared with the coral snakes of the genus *Maticora* in Southeast Asia.

(f) **Genus *Echis*.** The two species of this genus are sand vipers sometimes known as the saw scaled or carpet vipers. They live in the sandy regions of Africa, north of the equator and extend through Israel, Arabia and Persia to India. They sometimes burrow to hide. They are not confined to the arid plains, however, and also are found on the grassy, sandy plains and sandy forest lands. They are mainly nocturnal by habit and subsist largely on insects and small rodents. However, they are found sometimes during the day far from any source of water. These are snakes of quick movement and violent temper and bite at slight provocation. The venom of these snakes varies greatly in toxicity, that of the Indian species of *E. carinatus* being very toxic. Nevertheless, on the whole, the *Echis* species are not considered very dangerous because of their small size and ineffective bite.

(g) **Genus *Vipera*.** Members of this genus, with one exception (*V. superciliaris* of Mozambique), are found only in the northern part of Africa and resemble closely the European vipers in habits and habitat. In fact, the North African vipers are, in most instances, only sub-species of the vipers of the European and Mediterranean areas.

f. Poison Snakes of the Near and Middle East and India.

Most of the snakes in this area, regardless of species, resemble like species described in previous pages. The most common poisonous snakes are all adapted to life in a hot and dry environment and generally prefer rocks or sandy areas near a source of water as a habitat. They subsist on lizards, rodents and other small creatures including insects. An unusual feature of the snake fauna of this area is the presence of a species of the burrowing vipers (*Atractaspis engaddensis*) which is found rarely in the Dead Sea area. The species of eastern India and Pakistan belong to the same groups to be described under the poisonous snakes of Southeast Asia.

g. Poisonous Snakes of Southeast Asia.

(1) Family *Elapidae*.

(a) **Genus *Bungarus*.** The snakes of this genus are known as kraits. Most of them are brightly banded in black and white or black and yellow. They have a ridged backbone on which there is a row of enlarged scales. All kraits are very poisonous, but they are inoffensive snakes which will not bite unless stepped upon. The common krait moves around mostly at night and lives in open country rather than in thick jungle brush. It is often found near inhabited places and on trails at night. The banded krait prefers the thick jungle. Unlike the cobra, kraits do not raise the head to strike, nor do they strike in a loop like a viper—they simply flip the head to one side or the other and bite. Fatalities mainly result from stepping on these snakes at night with bare feet.

(b) **Genus *Callophis* and *Maticora*** (Coral Snakes). The coral snakes are inoffensive and disinclined to bite, even specimens in which their mouths are large enough to allow them effectively to bite. However, they will bite under extreme provocation and do so in the same manner as the kraits. *Callophis* is well represented on the Asiatic mainland and found in foot-hill country up to about 3,000 feet. It is not common. The genus *Maticora* is essentially restricted to Malaya. One species is common everywhere in the lowlands while another has taken to the mountains.

(c) **Genus *Naja*.** Cobras are the most common poisonous snakes in much of the region; they are particularly numerous in India where natives do not destroy them because of religious beliefs. Cobras are found most frequently in rocky places or in old buildings where they feed on rats. The most common species are not particularly vicious, but king cobras may attack deliberately, especially if guarding eggs. Cobras are slow snakes and always raise the head to strike. They can be killed with a stout stick swung in a plane parallel with the ground, aimed at the head or raised part.

The cobras in this part of the world bite with more determination and effectiveness at night than in the day; young cobras are more aggressive and irritable than adults. One of the species in Malaya has the habit of spitting its venom to the accompaniment of explosive hissing. In reality the venom is blown from the mouth in the form of a fine spray, and can be aimed by the snake, usually at the victim's yes, from a range of at least three feet. Cobras (except for the king cobra which avidly devours other snakes) in this area prefer a diet of rats, mice, toads and frogs.

(2) Family ***Crotalidae.*** The pit vipers of Southeast Asia belong to two genera: *Trimeresurus* and *Agkistrodon*. India has about a dozen species of these snakes. The pit vipers occur in all types of terrain and may be found in the trees or on the ground. The tree snakes are slender; the ground snakes are thicker and heavy-bodied. Only the larger ones are really dangerous. One of the pit vipers of China is a moccasin similar to those found in North America; it occurs in the rocky areas of the remote mountains of South China; it attains a length of 4½ feet but is not vicious unless irritated. A small pit viper, about a foot and a half long, is often found on the plains of Eastern China.

(3) Family ***Viperidae.*** The true vipers usually have heads which are much wider than the neck. The most common and most dangerous species is Russell's viper. The saw scaled viper is another dangerous species found in this region. The side scales of this snake are rough and somewhat sawtoothed. When disturbed, it writhes vigorously and makes a hissing noise as well as the crackling sound produced by coiling and rubbing the rough scales together. Although it is small, this viper is vicious and bites readily; snakes only a foot long have been known to kill. It prefers desert or dry areas and is not found in the thick jungle. Russell's viper also prefers open, sunny spots, but can be found almost anywhere except in thick jungle. It is not particularly vicious and will not strike unless it is considerably irritated. Fea's viper (*Azemiops feae*) occurs in upper Burma and what was formerly known as Indochina as well as southern China where it inhabits the low hilly country. This viper is unusual in that it has relatively short fangs. It is poisonous although not dangerously so. Very little is known of its habits or diet.

(4) Family ***Hydrophidae.*** Certain parts of the coastal waters of Southeast Asia abound with sea snakes. Many different genera have been identified, several of which are discussed in Chapter VII. One species and possibly two are amphibious and are more closely related to the land snakes than the majority of sea snakes. These serpents subsist entirely on marine animals, especially fish; one species limits its diet entirely to eels. Sea snakes are found in the relatively shallow coastal waters, especially near the mouths of rivers and streams. All sea snakes belong to the *Proteroglypha*, have flattened or oar-like tails and possess venom that is equal to or greater in toxic power than cobra venom. They are distinguished from eels by the fact that they have scales. Sea snakes sometimes may be seen in large numbers but they seldom will bite unless they are handled. They are not known deliberately to attack a man in the water. Groups of sea snakes many miles long have been reported more than a few times.

h. Poisonous Snakes of the Far East.

The poisonous snakes in this region resemble in habits and habitat the snakes described under Southeast Asia quite closely. The family *Elapidae* is represented by species of *Naja* and certain of the coral snakes. The family *Crotalidae* is represented by a few species of *Agkistrodon* and several species of *Trimeresurus*, many of which are arboreal. The sea snakes are found only in the southern part of this region; Russell's viper is the only species of the Family *Viperidae* to be found in the Far East.

i. The Poisonous Snakes of Australia, New Guinea and the Pacific Islands.

All of the poisonous snakes found in this area, except the sea snakes, belong to the family *Elapidae*.

(1) **Genus *Acanthophis*.** The two species of this genus are known as death adders. They are found in sandy localities over most of Australia except Victoria, and in New Guinea and the Moluccas. Because the death adder resembles the ground it lives on, it is likely to be stepped on. While the snake is not quick to strike, it can be dangerous if stepped on or otherwise irritated. The venom of this snake is highly poisonous.

(2) **Genus *Demansia*.** There are about a dozen species of this genus, collectively known as brown snakes. *This does not include the King Brown Snake.* These snakes are widely distributed all over Australia and are found also in New Guinea. They are not aggressive snakes unless disturbed. They strike from a looped position.

(3) **Genus *Denisonia*.** There are about two dozen closely related species in this genus that are called copperheads. (They are in no way related to the copperheads of the United States.) They are found in the southerly portions of Australia. They frequent swamps and feed on lizards and frogs. When angry, these snakes rear their heads a few inches from the ground, with the neck arched slightly, somewhat in the manner of a cobra. Normally, the copperhead is not aggressive unless irritated or stepped on.

(4) **Genus *Notechis*.** This genus is represented by only one species, *N. scutatus*, known widely as the tiger snake. This snake lives in dry country ranging extensively throughout Australia and Tasmania. It is a savage and dangerous reptile which causes more deaths in Australia than all the other snakes combined which are found there. Tiger snakes are quick to bite, spreading the neck and lunging with a flashing stroke that is so vigorous it may sometimes move the body forward, so that the snake seems to be making a short jump.

(5) **Genus *Oxyuranus*.** This genus also is represented by only one species, *O. scutellatus*, the taipan or giant brown snake. It reaches a length of over 9 feet and is known to be the deadliest snake in Australia. Recovery from a bite by a large specimen is quite unlikely *unless* treatment, including antivenom, is applied immediately. Only two survivors were known prior to the development of an antivenom. The ferocity of this snake when handled is unequalled. It is rarely encountered except on the Cape York peninsula; occasionally found in New Guinea. Generally speaking it resembles the black snakes in habitat and habits and may be confused, because of coloration, with the king brown snake, a member of the black snake genus, *Pseudechis*. In fact, this snake (taipan) was formerly a member of that genus.

(6) **Genus *Pseudechis*.** This genus includes the red-bellied black snakes and the king brown snake. The members of this genus are widely distributed throughout Australia except that the king brown snake is not found in Tasmania. They prefer marshy places or streams; they dive and swim well and can stay under the water for long periods of time. Because they lie still on the bottoms of streams, they may be dangerous to swimmers and bathers. The black snakes will not attack unless stepped upon or cornered. When angry they raise their heads a few inches from the ground on a slanting plane and strike from that position. Usually they faint (i.e., bluff) without making serious attempts to bite, but when aroused they may bite repeatedly. However, they are unlikely to deliver a lethal bite.

CHAPTER VII

Description and Distribution of Poisonous Snakes

1. INTRODUCTION

This chapter is devoted entirely to detailed description and distribution of the most important individual species. This information is intended to be used as confirmatory material supplementing that provided in the keys. Identifications should never be made purely on the basis of these individual descriptions because many of the critical characteristics do not appear in a brief description such as presented here.

In many instances diagrams of head scalation, black and white photographs or both are included as additional aids to identification. It is again emphasized that identification should never be made on the basis of diagrams or photographs.

It will be noticed that many of the species, differentiated in the keys, are not individually described since they are believed, in most cases, to be rare or do not present a dangerous medical problem. This is, however, not true of subspecies (snakes with three Latin names). They must be considered as dangerous as the type species. This is not to underestimate the serious nature of any snakebite, but only to indicate that some are more dangerous than others.

When snakes which have bitten individuals cannot be identified, the specimens should always be preserved and delivered as soon as possible to local authorities competent in this field such as zoos, medical schools, or zoologists at universities throughout the world. Case histories and statistics relative to the incidence of snakebite should be maintained and submitted periodically to the Bureau of Medicine and Surgery, U. S. Navy.

A few snakes occur on two or more continents and, in such instances, the description will be found under the continental area in which it is most numerous.

2. SNAKES OF NORTH, CENTRAL, AND SOUTH AMERICA

1. Agkistrodon bilineatus
2. Agkistrodon contortix
3. Agkistrodon piscivorus
4. Bothrops anternatus
5. Bothrops ammodytoides
6. Bothrops atrox
7. Bothrops godmani
8. Bothrops jararaca
9. Bothrops jararacussu
10. Bothrops lansbergi
11. Bothrops neuwiedii
12. Bothrops nigriviridis
13. Bothrops nummifer
14. Bothrops schlegeli
15. Crotalus adamenteus
16. Crotalus atrox
17. Crotalus basiliscus
18. Crotalus cerastes
19. Crotalus durissus durissus
20. Crotalus durissus terrficus
21. Crotalus horridus
22. Crotalus lepidus
23. Crotalus mitchelli
24. Crotalus molossus molossus
25. Crotalus ruber
26. Crotalus scutulatus
27. Crotalus tigris
28. Crotalus viridis viridis
29. Crotalus willardi
30. Lachesis mutus
31. Micruroides euryxanthus
32. Micrurus coralinus
33. Micrurus elegans
34. Micrurus frontalis

2. SNAKES OF NORTH, CENTRAL, AND SOUTH AMERICA—Continued

35. Micrurus fulvius
36. Micrurus hemprichii
37. Micrurus lemniscatus
38. Micrurus mipartitus
39. Micrurus narduccii
40. Micrurus psyches
41. Micrurus spixii
42. Sistrurus catenatus
43. Sistrurus miliarius

"Cantil", Mexican Moccasin; (*Agkistrodon bilineatus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23 (rarely 25); Ventral (Belly) Plates: 135–141; Subcaudal (Tail) Plates: 52–64; Anal Plates: entire; Pre- and Post-Ocular Shields: 2 and 2.

Description: Snout obtusely pointed, not turned up, flat above, with sharp canthus. Rostral as deep as broad or slightly broader than deep; a pair of internasals and a pair of prefrontals; frontal shorter than its distance from the end of the snout, as long as or shorter than the parietals; upper preocular separated from the posterior nasal by a loreal; 2 postoculars and one or 2 suboculars, separating the eye from the labials; 8 or 9 (rarely 7) upper labials, 2nd forming the anterior border of the loreal pit; anterior subcaudals single, posterior paired, the divided shields usually more numerous than the single; dorsal scales more or less strongly keeled. Length 1100 mm. tail 200 mm.

Color: Yellowish or reddish to dark brown above, with more or less distinct darker crossbands or alternating transverse blotches with interrupted yellow edges; a vertical yellow, black-edged line on the rostral and mental shields, a fine yellow line round the snout on the canthus, continued behind the eye to the neck, and a broader yellow, black-edged streak on the upper lip from the anterior nasal to the last labial; brownish to blackish beneath, with white, black-edged markings.

Distribution: Mexico, British Honduras, Guatamala, Nicaragua, Honduras, Costa Rica, San Salvador.

Copperhead; (*Agkistrodon contortix*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23 (rarely 25); Ventral (Belly) Plates: 145–155; Subcaudal (Tail) Plates: 31–52; Anal Plates: entire; Pre- and Post-Ocular Shields: 2 and 2–3.

Description: Snout rounder or truncate not turned up, flat above, with sharp canthus. Rostral one and one fourth to one and a half as broad as deep; a pair of internasals and a pair of prefrontals; frontal as long as or a little shorter than its distance from the end of the snout, usually longer than the parietals; loreal present usually separating the upper preocular from the posterior nasal; two or three postoculars and one to three suboculars, separating the eye from the labials; 8 (rarely 9) upper labials, 2nd usually forming the anterior border of the loreal pit; scales strongly keeled; subcaudals single at anterior end while posterior plates are paired. Length: 990 mm., tail 110 mm.

Color: Yellowish, pinkish, or pale reddish brown above, with dark brown, reddish brown, or brick-red crossbars contracting in the middle; these bars sometimes are broken up on the vertebral line forming alternating triangles; a dark temporal streak sometimes present; yellowish or reddish beneath, more or less profusely speckled with grey or brown and with a lateral series of large blackish spots.

Distribution: North America, from Massachusetts and Kansas to Northern Florida and Texas.

Cottonmouth, Water Moccasin; (*Agkistrodon piscivorus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25 (rarely 27); Ventral (Belly) Plates: 130–147; Subcaudal (Tail) Plates: 33–51; Anal Plates: entire; Pre- and Post-Ocular Shields: 2 and 2.

Description: Snout rounded, not turned up, flat above, with sharp canthus; rostral as deep as broad or slightly broader than deep; a pair of internasals and a pair of prefrontals; frontal as long as or a little shorter than its distance from the end of the snout, as long as or shorter than the parietals, which are usually followed by a pair of occipitals; no loreal; upper preocular in contact with the posterior nasal; two postoculars and one or two suboculars; 7 or 8 upper labials, second forming the anterior border of the loreal pit, third usually touching the eye; scales strongly keeled; subcaudals all single or a few posterior ones divided. Length 1170 mm; tail 200 mm.

Color: Pale reddish brown to dark brown above, with more or less distinct dark brown or black crossbands with broken outlines, or with alternating C-shaped dark markings each enclosing a central spot; a dark, light-edged band from the eye to the angle of the mouth; beneath yellowish, spotted with black, or black with or without lighter variegations.

Distribution: Found only south of a line connecting northeast Massachusetts with Pittsburgh, Pa., with extreme southeast Nebraska and upper Rio Grande, passing just southeast of New Mexico; not found north of lowlands nor in Florida; found in extreme northern Mexico.

"Urutu", "Wutu"; (*Bothrops alternatus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 29–35; Ventral (Belly) Plates: 167–181; Subcaudal (Tail) Plates: 34–51; Anal Plates: entire; Pre- and Post-Ocular Shields: 2–3 post.

Description: Head narrow, elongate; snout obtusely pointed, with sharp canthus; rostral as deep as broad or a little deeper than broad; nasal divided; upper head scales: small, imbricate, strongly keeled, in 10 to 13 longitudinal series between the supraoculars, which are rather narrow; a pair of large internasals, in contact with each other, each followed by a canthal; 2–3 postoculars and 1–2 suboculars, separated from the labials by two series of scales; loreal pit separated from the labials by small scales; temporal scales keeled; 8–9 upper labials, second small; dorsal scales very strongly keeled; subcaudals paired; length 1190 mm., tail 110 mm.

Color: Brown above, very elegantly marked with opposite or alternating pairs of large ◠-shaped, or "French"-phone-shaped, dark brown markings edged with black and yellow and separated by narrow interspaces of the ground color; a series of smaller spots on each side; head dark brown above, with ⊼-shaped light marking, the transverse branch between the eyes, and a light line from the canthus rostralis to the angle of the mouth; rostral and anterior labials white, the former with a dark brown vertical bar; chin and throat with dark longitudinal streaks; belly whitish, spotted with brown or black tail with two dark streaks below; length 1190 mm., tail 110 mm.

Distribution: Argentina, Uruguay, Paraguay, Brazil, Bolivia.

Patagonian Pit Viper; (*Bothrops ammodytoides*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23–25; Ventral (Belly) Plates: 149–160; Subcaudal (Tail) Plates: 30–38; Anal Plates: entire.

Description: Snout turned up and produced in a low wart, as in *V. latastii;* rostral once and a half as deep as broad; nasal divided, upper head shields (scales) small, imbricate, keeled; suproculars large, separated from each other by 8–9 series of scales; two series of scales between the eye and the labials; temporal scales keeled; 9–10 upper labials, second separated from the loreal pit, third and 4th largest; scales very strongly keeled; subcaudals paired; length 460 mm., tail 55 mm.

Color: Pale brown above, with large square dark brown black-edged spots or crossbands which may alternate and form a zigzag band; a dark streak behind the eye; belly yellowish, dotted with brown.

Distribution: No other poisonous snake lives as far south; found in Northeastern Patagonia and the Argentine states of Santa Cruz to Tucuman—does not inhabit lowlands of the eastern states.

Fer-de-lance; Jararaca, Terciopelo (Costa Rica); Equis, Tomigoff (Panama); Manapare, Barba Amarrilla (yellow beard) South America. (*Bothrops atrox*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–29 (usually 27); Ventral (Belly) Plates: 161–216; Subcaudal (Tail) Plates: 47–73; Anal Plates: entire; Pre- and Post-Ocular Shields: 2 post.

Description: Snout obtusely pointed, with sharp, slightly raised canthus; rostral as deep as broad or a little deeper than broad; nasal divided; upper head-scales small, imbricate, more or less strongly keeled, in 5–9 longitudinal series between the supraoculars, which are large; a pair of large internasals, forming a suture with each other, and a large canthal; two postoculars and one, two, or three suboculars, separated from the labials by one series of scales; temporal scales keeled; seven (rarely eight) upper labials, second forming the anterior border of the loreal pit; 9–11 labials; dorsal scales strongly keeled, the keels on the posterior part of the back very high, swollen in the middle and much shorter than the scale; length 1110 mm; tail 180 mm.

Color: Brown above, with more or less distinct dark, light-edged crossbands or triangles with the apices approximating on the vertebral line forming "X"-shaped marks; a more or less distinct dark streak from the eye to the angle of the mouth; belly yellowish white, much speckled and blotched with brown, or brown spotted with yellowish white.

Distribution: From Central America to Peru and Northern Brazil, (Guatemala, Costa Rica, San Salvador, Nicaragua, Panama, Colombia, Ecuador, Peru, Venezuela, Trinidad, British Guiana, Surinam, French Guiana, Brazil.) Also found occasionally in Paraguay and Northern Argentina to 27° S.

N.B.—Recognition south of Amazon may be difficult (skin not rasp-like, pattern extremely variable and complex).

Godman's Pit Viper; (*Bothrops godmani*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21; Ventral (Belly) Plates: 135–142; Subcaudal (Tail) Plates: 22–34; Anal Plates: entire.

Description: Snout broad, rounded, with well-marked canthus; rostral as deep as broad or a little broader than deep; nasal divided; upper head-scales imbricate, feebly or moderately keeled, subequal or with a few enlarged shield-like ones on the vertex; 5–7 scales in a series of scales between the eye and the labials; temporal scales keeled; loreal pit separated from the labials by small scales; 9–10 upper labials, the three anterior smallest, 11 lower labials; dorsal scales strongly and sharply keeled; subcaudals single; length 610 mm; tail 60 mm.

Color: Brown above, with or without a dorsal series of large darker spots and two lateral series of dark brown or blackish alternating spots, the lower on the ventrals and lost on the anterior half of the body; a dark streak from the eye to a little beyond angle of the mouth; belly yellowish, more or less speckled or spotted with grey or blackish.

Distribution: Mexico, British Honduras, Guatemala, Honduras, Nicaragua, San Salvador, Costa Rica, Panama.

Jararaca; (*Bothrops jararaca*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

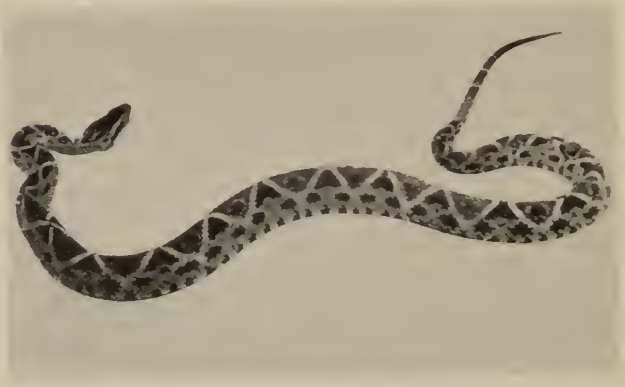
Identifying Characteristics: Dorsal (Back) Scale Rows: 23–33; Ventral (Belly) Plates: 180–240; Subcaudal (Tail) Plates: 46–70; Anal Plates: entire; Pre- and Post-Ocular Shields: 2–3 post.

Description: Snout rounded or obtusely pointed with sharp, slightly raised canthus; rostral as deep as broad; nasal divided; upper head-scales small, imbricate, more or less strongly keeled, in 5–10 longitudinal series between the supraoculars, which are large; a pair of large internasals, usually forming a suture with each other, and a large canthal; 2–3 postoculars and 1, 2, or 3 suboculars, separated from the labials by one or two series of scales; temporal scales keeled; 7–8 upper labials, second forming the anterior border of the lorealpit; dorsal scales sharply keeled; subcaudals all or greater part in two rows; length 1600 mm; tail 190 mm.

Color: Coloration very variable; grey, brown, yellow, olive, or reddish above, uniform or with more or less distinct dark spots or crossbands, or with dark triangles on the sides inclosing pale rhombs; a dark streak from the eye to behind angle of the mouth; lower parts yellowish, uniform or powdered or spotted with brown, or brown with light spots.

Distribution: Mexico, Guatemala, Honduras, Martinique and St. Lucia, Venezuela, Paraguay, Brazil Argentina Bolivia, Peru, Ecuador, Colombia, Nicaragua, British Honduras, Costa Rica, Panama.

Jararacussu, Yararaguassu (*Bothrops jararacussu*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 23–27; Ventral (Belly) Plates: 170–186; Subcaudal (Tail) Plates: 60–66; Anal Plates: divided; Pre- and Post-Ocular Shields: 2 and 1–3.

Description: Snout sharp or acutely pointed and short; distinctly raised canthus rostralis and very long canthals which are almost continuous with each other and are flat and usually wider than long; 8 upper labials (very rarely 7); 10 lower labials (exceptionally 9–11); head short and very wide posteriorly; rostral as deep as wide; nasal divided; 4–8 longitudinal scale rows between supraoculars; 1–3 suboculars, separated from upper labials by 1–2 series of scales; temporal scales distinctly keeled; dorsal scales somewhat rounded and distinctly keeled, the keels of the high and long type; practically all subcaudals paired; an amphibious species, it prefers the lowlands near rivers and streams or lakes; maximum length 1500 mm; tail 175 mm.

Color: Dark yellow above, with wide angular somewhat diamond-shaped black markings (lateral series), alternate with or opposite to those of the other side, each branch of the marking inferiorly followed by a round black spot with which it is usually connected in adult specimens; wide areas of dark pigment with a few lighter or double-colored ocelli sometimes found among the lateral markings along the vertebral region; head black above with a yellow streak along each temporal region from the supraocular to the side of the nape; belly yellow irregularly blotched with dark brown or black. Changes in pattern may occur.

Distribution: Brazil, Argentina, Paraguay and Bolivia.

Hog-nosed viper, Lansberg's Pit Viper, Chatilla Tamaga. (*Bothrops lansbergi*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–27 (rarely 23); Ventral (Belly) Plates: 147–159; Subcaudal (Tail) Plates: 29–35; Anal Plates: entire.

Description: Snout pointed, with sharp canthus, turned up at the end, as in *Vipera aspis;* rostral once and one third to once and a half as deep as broad; nasal divided or semidivided; a pair of raised internasals; upper head-scales small, imbricate, strongly keeled; supraoculars large, separated by 5–7 series of scales; 2–3 series of scales between the eye and the labials; temporal scales keeled; 8–10 upper labials, none bordering the loreal pit, fifth, 4th and 5th, or 5th and 6th largest; dorsal scales strongly keeled; subcaudals single; length, 575 mm; tail 70 mm.

Color: Yellowish brown, pale brown, or grey above, with a dorsal series of large dark brown black-edged rhomboidal or squarish spots, usually divided by a narrow yellow or orange vertebral line; sides of head blackish; belly powdered with brown, with or without whitish spots.

Distribution: Southern Mexico, British Honduras, Guatemala, Nicaragua, Costa Rica, San Salvador, Honduras, Panama, Venezuela, Colombia, and Brazil.

N.B.—*Bothrops ophryomegas* is a synonym.

Maximillian's Pit Viper; jararaca; Urutu. (*Bothrops neuwiedii*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–27; Ventral (Belly) Plates: 168–182; Subcaudal (Tail) Plates: 41–53; Anal Plates: entire; Pre- and Post-Ocular Shields: 2–3 post.

Description: Resembles Fer-de-lance; snout obtusely pointed, with strong, slightly raised canthus; rostral as deep as broad; nasal divided; upper head-scales small, imbricate, strongly keeled, largest on the snout; supraoculars large and in contact with each other; a large canthal; 2–3 series of scales; loreal pit separated from the labials; temporal scales keeled; 8–9 upper labials; dorsal scales very strongly keeled; subcaudals all or greater part in two rows; length 770 mm; tail 120 mm.

Color: Yellowish or pale brown above, with dark brown, black-edged spots; the spots on the back forming a single series or a double alternating series; a lateral series of small spots; a dark spot on the snout, a pair of dark bands from the vertex to the nape, and another from the eye to angle of the mouth; all these markings may have a fine yellow edge; yellowish beneath, more or less profusely dotted or powdered with brown and largely spotted on the sides.

Distribution: Bolivia, Argentina, Uruguay, Paraguay, Brazil.

Palm Viper; (*Bothrops nigriviridis*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19; Ventral (Belly) Plates: 134–146; Subcaudal (Tail) Plates: 49–54; Anal Plates: entire; Pre- and Post-Ocular Shields: 2 post.

Description: Snout short, rounded, with sharp canthus; rostral as broad as deep or a little broader than deep; nasal entire or semidivided; upper head-scales flat and imbricate, largest and smooth on the snout and vertex; 5–7 longitudinal series of scales between the supraoculars, which are large and sometimes broken up into two; internasals small; two postoculars and a subocular, separated from the labials by one series of scales; temporal scales obtusely keeled; 9–11 upper labials second only exceptionally forming the anterior border of the loreal pit; dorsal scales rather feebly keeled; subcaudals single; tail prehensile; length 535 mm; tail 90 mm.

Color: Green or olive above, speckled and spotted with black; a black streak on each side of the head, from the canthus rostralis, over the outer border of the supraocular shield, to a little beyond the angle of the mouth; upper surface of head sometimes with black longitudinal streaks; yellowish beneath, some or all of the shields black-edged.

Distribution: Costa Rica.

Jumping Pit Viper, timba, mano de piedra; (*Bothrops nummifer*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23–27; Ventral (Belly) Plates: 120–134; Subcaudal (Tail) Plates: 26–36; Anal Plates: entire.

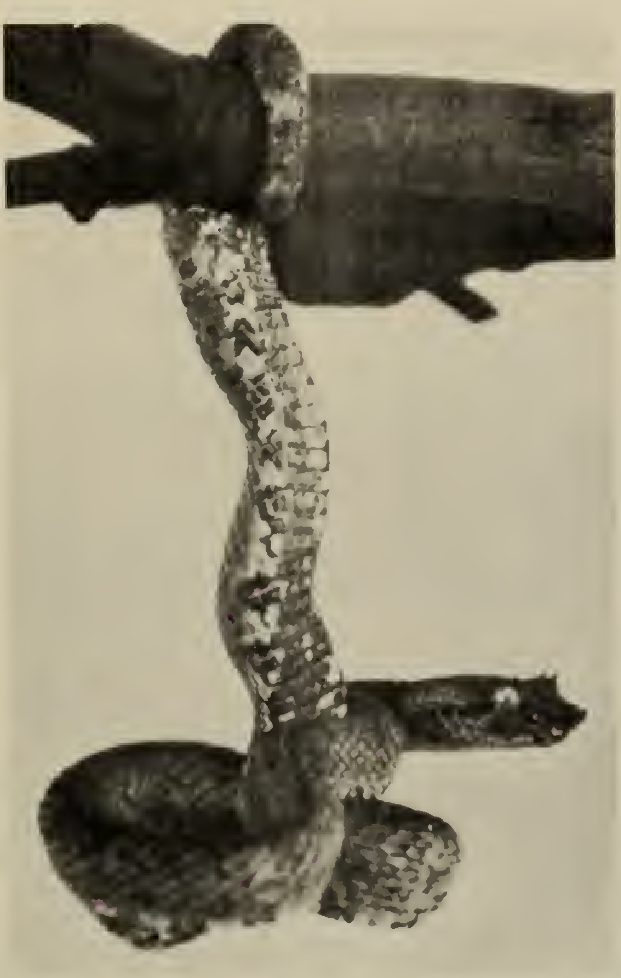
Description: Snout broad, rounded, with moderately marked canthus; rostral as deep as broad or a little broader than deep; nasal divided, sometimes separated from the rostral by a series of small scales; upper head-scales imbricate, strongly keeled, 7–10 in a series between the supraoculars, which are very narrow and sometimes broken up; no enlarged internasals; three or four series of scales between the eye and the labials; temporal scales strongly keeled; loreal pit separated from the labials by small scales; 10–11 upper labials, 4th and 5th largest; 10–12 lower labials; dorsal scales strongly keeled, tuberculated on the back in adults; subcaudals all or greater part single; length 800 mm; tail 90 mm.

Color: Pale brown above, with a dorsal series of dark brown, black-edged, rhomboidal spots, which may be confluent and form a zigzag band; a lateral series of dark brown or black spots or vertical bars; a dark brown streak on the side of the head, from the eye to angle of the mouth; whitish beneath, uniform or spotted with dark brown.

Distribution: Mexico, British Honduras, Nicaragua, Honduras, Costa Rica, San Salvador, Guatemala and Panama.

N.B.—Very bad tempered; strikes so vigorously tail may sometimes leave the ground; venom of lower toxicity than other species of *Bothrops.*

Bocaraca; toboba de pestana; Eyelash Viper; Schlegel's Palm Viper. (*Bothrops schlegeli*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 19–25; Ventral (Belly) Plates: 138–162; Subcaudal (Tail) Plates: 47–62; Anal Plates: entire.

Description: Snout rounded, with sharp canthus; rostral as deep as broad or broader than deep; nasal entire or semidivided; upper head-scales more or less strongly keeled, rarely smooth on the snout and vertex; a large supraocular shield, separated from the eye by small scales, 2–3 of which may be enlarged, erect and hornlike; 5–9 longitudinal series of scales between the supraoculars; two 2–3 series of scales between the eye and the labials; temporal scales keeled; 8–9 upper labials, 2nd forming the anterior border of the loreal pit, 3rd and 4th largest; dorsal scales more or less strongly keeled; subcaudals single; tail prehensile; length 600 mm; tail 115 mm.

Color: Coloration very variable; green or olive above, speckled or spotted with black, or with pinkish, reddish, or purplish, black-edged spots or crossbars; a series of yellow spots usually present on each side close to the ventral shields; belly yellow, spotted with green, or green speckled with black and yellow, or variegated yellow, olive, purple, and black; end of tail usually red.

Distribution: Mexico, British Honduras, Nicaragua, Honduras, Guatemala, Costa Rica, San Salvador, Panama, Colombia, Ecuador, Venezuela, Surinam, British Guiana, French Guiana, Brazil.

Eastern Diamond Rattlesnake; (*Crotalus adamanteus*); Family: *Crotalidae*; Fang Group: *Solenoglypha.*

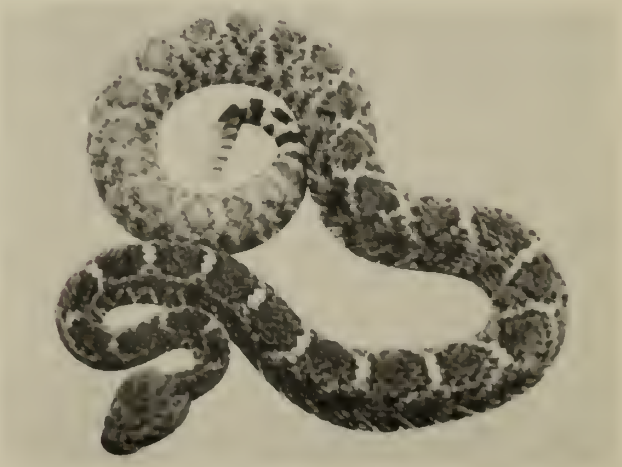
Identifying Characteristics: Dorsal (Back) Scale Rows: 25–31; Ventral (Belly) Plates: 165–187; Subcaudal (Tail) Plates: 20–33.

Description: 12–17 upper labials, 15–21 lower labials; a vertical line on posterior edges of prenasals and 1st upper labials; maximum length 2440 mm; rostral usually edged with white; a lowland species.

Color: Ground color dark brown or dusky black; pattern of 26–34 (average 30) black or dark brown diamonds, wider than long; lighter in the centers, and bordered by a row of cream or light yellow scales; ground color of tails same as that of body; tail rings black, 5–10 in males, 3–6 in females; head dark above but marked with yellowish white lines on sides; a conspicuous vertical light line on the posterior edge of the prenasals and supralabials; rostral usually edged with white.

Distribution: The coastal plain of the southeastern U.S., including all of Florida, from southern Mississippi to east-central North Carolina (possibly extends to Louisiana).

Western Diamondback Rattlesnake (*Crotalus atrox*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 23–29 (Usually 25); Ventral (Belly) Plates: 171–196; Subcaudal (Tail) Plates: 16–32; Anal Plates: entire.

Description: Canthus obtuse; rostral as deep as broad or a little deeper than broad, in contact with the anterior nasal; upper head-scales small, straited; supraoculars transversely, striated, as broad as or slightly narrower than the space between them, which is filled by 3 to 10 longitudinal series of scales; each supraocular in contact with 6 to 11 scales in addition to the pre- and postoculars; 3–4 series of scales between the eye and the labials; 12–18 upper labials; 14–20 lower labials; dorsal scales striated and strongly keeled; subcaudals all or a greater part single; length 1520 mm; tail 140 mm.

Color: Yellowish, greyish, or pale brown above, with a dorsal series of large brown or red spots, usually edged with darker and lighter and commonly rhomboidal or transversely elliptic in shape; a light streak or triangular marking across the supraocular shield; a more or less distinct dark, light-edged streak from the eye to the mouth; yellowish beneath, uniform or spotted with brown.

Distribution: Western North America, from British Columbia to southern California, eastwards to Dakota, Nebraska, Kansas, and western and southern Texas; northern Mexico.

Mexican West Coast Rattlesnake; (*Crotalus basiliscus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–29; Ventral (Belly) Plates: 179–206; Subcaudal (Tail) Plates: 18–36; Pre- and Post-Ocular Shields: 2 and 4–7.

Description: Rostral of moderate size, acute at the apex, higher than wide, and in contact with internasals, prenasals and first upper labials; on the muzzle usually 6 scales symmetrically arranged; a pair of moderate sized internasals, a pair of large anterior canthals and a pair of small posterior canthals; between supraoculars in frontal region a transverse row of 2–3 large scales immediately posterior to the canthals; this followed by irregular transverse rows of 4–5 smaller scales; scales of parietal, occipital and upper temporal regions small, rather strongly keeled, and irregular in arrangement; lower temporals smooth; loreals usually 2 on each side, occasionally 1 or as many as 5; eye separated from labials by 2–4 scales, usually 3; one pair of chin shields, each twice as long as wide, followed by 5–6 irregular pairs of median gulars; lateral gulars between the first ventral and last upper labial in 9–11 oblique rows; length about 2000 mm.

Color: Pigmentation is largely confined to individual scales as in *C. molossus* although to a lesser extent; dorsal ground color is yellowish-olive, olive-grey or greenish olive, the green more conspicuous in large specimens; no fine brown or black stippling; body pattern consists of a median series of diamond-shaped blotches, 29–40 in number; except in very large specimens the blotches are reddish brown in color, lighter in the center, and bordered by a row of light yellow or white scales not always in a straight line on a side; alternating with the spots of the main series and the ventrolateral series which are opposite, are small, indistinct, reddish brown midlateral blotches covering only a few scales wand without light borders; labials, chin shields and throat are white, cream colored or pale yellow, faintly clouded with grey; ventral ground color of the body is the same but with grey blotches more conspicuous posteriorly; tail is grey or greyish black with 5–12 dark cross bands.

Distribution: West Coast of Mexico from central Sinaloa to central Oaxaca; Honduras, Guatemala, Nicaragua, San Salvador, Costa Rica, Panama(?).

Horned Rattlesnake, “Sidewinder”; (*Crotalus cerastes*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

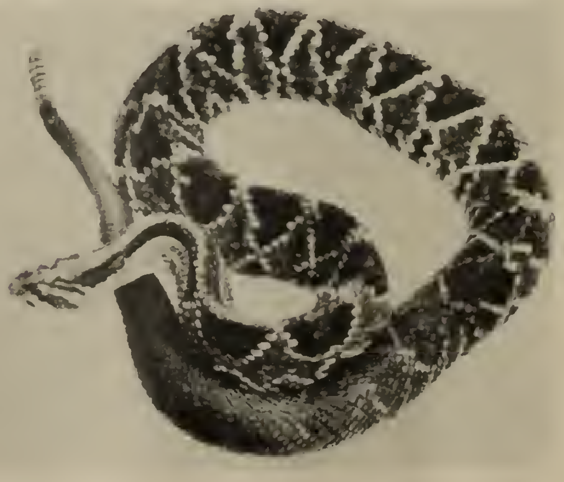
Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 146; Subcaudal (Tail) Plates: 17; Anal Plates: entire.

Description: Canthus rostralis rounded; rostral as broad as deep or a little broader than deep, in contact with the nasal, which is single; snout and vertex covered with small scales; supraocular produced into a raised horn-like process; 2–3 series of scales between the eye and the labials; 11–13 upper labials; dorsal scales feeble keeled, each scale along the middle of the back with a centeral tubercular swelling; length 250 mm; tail 20 mm.

Color: Yellowish above, with a dorsal series of rather indistinct brown blotches; a narrow brown streak from the eye to the angle of the mouth.

Distribution: U.S., Mexico; southwest Utah, west to Sierra Nevada mountains in southern California and into northeastern Lower California and northwest Sonora.

Tropical Rattlesnake, Cascavel, Cascabel (*Crotalus durissus durissus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 27–31 (29); Ventral (Belly) Plates: 170–187 (178); Subcaudal (Tail) Plates: 20–34 (27); Anal Plates: entire.

Description: Canthus rostralis obtuse; rostral deeper than broad, in contact with the anterior nasal; upper surface of snout covered with scales or small irregular shields; 7–8 longitudinal series of scales between the supraoculars, the width of which is much less than the interspace between them; 3–4 series of scales between the eye and the labials; 13–17 upper labials, 13–19 lower labials; dorsal scales strongly keeled; the largest species of the genus, reaching a length of 8 feet.

Color: Pale greyish or brownish above, with a dorsal series of large blackish rhombs, usually with lighter centers, edged with yellowish; snout blackish, with a yellowish cross-line between the eyes, yellowish margins to the rostral shields, and a yellowish vertical streak between the rostral and the nostril, on the anterior nasal and first upper labial; a broad blackish band, edged with yellowish above and beneath, extends from the supraocular, over the eye, to the 4–5 last upper labials; end of tail usually black; yellowish beneath, more or less spotted with brown or black.

Distribution: Southeastern U.S. from North Carolina to Florida keys and the Mississippi River; Mexico and all of Central America; Trinidad and Tabago Is.; Venezuela, Colombia, Ecuador, Peru, Bolivia, Uruguay, Paraguay, Brazil, French and British Guiana and Surinam, and Argentina to 32° S.

Cascabel, Boiciuinga, Maracaboia and Borquira (Brazil); (*Crotalus durissus terrificus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–33 (27); Ventral (Belly) Plates: 163–182 (173); Subcaudal (Tail) Plates: 19–32 (25); Anal Plates: entire.

Description: Snout very short, with obtuse canthus; rostral as deep as broad or a little deeper than broad, in contact with the anterior nasal; upper surface of snout covered by a pair of internasals and a pair of prefrontals, rarely with 1–2 small shields between them; scales between the supraoculars often more or less enlarged or shield-like, in 2–5 longitudinal series; 3–4 series of scales between the eye and the upper labials; upper labials 11–17, lower labials 13–18; dorsal scales very strongly keeled; length 1320 mm; tail 130 mm, but may grow up to 7 ft.

Color: Brown above, with a series of darker, light-edged rhombs, often lighter in the center, in contact with one another or narrowly separated, or with decussating yellow lines; occiput and neck with or without two more or less distinct dark parallel stripes; a dark streak from the eye to the angle of the mouth, and often another from the loreal pit to below the eye or beyond; the markings sometimes indistinct; yellowish white beneath uniform or spotted with brown; tail usually brown or blackish.

Distribution: Mexico to southern Brazil and northern Argentina, except Chile and higher parts of Andes and Panama(?).

British Honduras
Nicaragua
Honduras
Guatemala
Costa Rica
San Salvador
Trinidad-Tobago
Venezuela
Colombia
Uruguay
Paraguay
Ecuador
French Guiana
British Guiana
Surinam

Banded Rattlesnake, Timber Rattler, Canebrake Rattler (*Crotalus horridus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–26 (23); Ventral (Belly) Plates: 158–178 (170); Subcaudal (Tail) Plates: 13–29 (22); Anal Plates: entire.

Description: Snout with obtuse canthus; rostral as deep as broad, in contact with the anterior nasals and a pair of rather large internasals; a large shield between the internasal and supraocular; middle of snout with scales or small shields; supraoculars considerably narrower than the space between them, which is covered by 3–8 longitudinal series of small scales; 3–4 series of scales between the eye and the labials; 10–17 upper labials, 11–19 lower labials; dorsal scales strongly keeled; length 1340 mm; tail 135 mm.

Color: Greyish brown above, usually with a rusty vertebral stripe and V- or M-shaped blackish crossbands; head uniform above, with a more or less distinct dark band from the eye to the angle of the mouth; usually a pair of roundish or triangular dark spots on the nape; neck with elongate spots or interrupted stripes; yellowish beneath, uniform or speckled or spotted with black; end of tail blackish; some so black, bands do not show up.

Distribution: Canada, U.S., Mexico; occasionally seen between Lake Erie and Lake Ontario; also on Point Pelee, southernmost extremity of Ontario, and from Maine to Minnesota to Texas and northern Mexico.

N.B.—Bold black bands distinguish from other poisonous species.

Eastern Rock Rattlesnake; Green Rock Rattlesnake; (*Crotalus lepidus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–25 (23); Ventral (Belly) Plates: 149–168 (161); Subcaudal (Tail) Plates: 17–29 (22).

Description: Canthus rostralis obtuse; rostral broader than deep, in contact with the nasal, which is semidivided; upper surface of snout with eight small smooth shields; supraoculars as broad as the space between them, which is occupied by 3 series of scales; upper preocular divided vertically; two series of scales between the eye and the labials; 10–14 upper labials, 10–13 lower labials; dorsal scales strongly keeled; length 350 mm; tail 60 mm.

Color: Brown or greenish grey above, with distant dark brown or jet-black light edged crossbands narrowing on the sides; two dark spots or a V- or heart-shaped black marking on the nape; a dark streak behind the eye present or absent; beneath dirty white spotted with brown.

Distribution: U.S., Mexico. Texas (west of 98° W. and 31° S.), southwestern New Mexico and extreme southeast Arizona; higher parts of Mexico south to Jalisco.

Mitchells Rattlesnake; (*Crotalus mitchelli*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25; Ventral (Belly) Plates: 178–198; Subcaudal (Tail) Plates: 24–26; Anal Plates: entire.

Description: Snout without canthus; rostral broader than deep, separated from the anterior nasal by scales; upper head-scales small, striated; supraoculars striated; 3 series of scales between the eye and labials; 14–16 upper labials; dorsal scales strongly keeled, striated; length 1020 mm; tail 90 mm.

Color: Greyish yellow to salmon-red above, finely punctulated with brown, with a dorsal series of transverse darker spots; yellowish beneath.

Distribution: U.S., Mexico. Southwest Nevada, southern California, central and western Arizona and Lower California.

Black-tailed Rattlesnake, Northern Black-tailed Rattlesnake, Dog-faced Rattlesnake; (*Crotalus molossus molossus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–29; Ventral (Belly) Plates: 178–199; Subcaudal (Tail) Plates: 18–29; Pre- and Post-Ocular Shields: 2 and 3–7.

Description: 14–20 upper labials, 15–21 lower labials; body blotches usually fewer than 38; usually 8 or less large flat scales in internasal-prefrontal area, scales on the crown and in frontal area flat and smooth, although edges may curl upwards; length 1257 mm; anterior nasal almost invariably in direct contact with rostral; 1st upper labial usually completely separated from prenasal by one, or sometimes two, rows of small scales; although the loreals are normally 2 on each side, they are commonly more numerous, frequently 3–4 and rarely as high as 8 or as low as 1. The preoculars are completely separated from the postnasal by the loreals; eyes usually separated from supralabial by 3 scales; 1st lower labials rarely divided; a single pair of chin shields, each about one and one half times as long as wide, if followed by several irregular pairs of median gulars.

Color: Pigmentation of both ground color and pattern is confined to the individual scales; that is, each scale is unicolor, not bisected by the pattern elements; the ground color in life is grey, greenish grey or yellow without minute dark punctations; body pattern consists of a series of 23–41 rhomboid blotches sometimes confluent on the neck but distinct on the remainder of the body; outer angles of the blotches normally connect with the lateral series of spots and extend downward to the ventrals as dark crossbands; rhombs of the main series are dark brown or black, usually with a few light colored scales on each side of the mid-line, and are bordered with a row of scales lighter than the ground color; the ventral surface is white, pale grey or yellow, indistinctly blotched or clouded with grey.

Distribution: From West Texas to Arizona south through Sonora, Chihuahua states to southern Coahuila and south-central Nuevo Leon, Mexico.

Red Diamond Rattlesnake; (*Crotalus ruber ruber*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–31; Ventral (Belly) Plates: 185–206; Subcaudal (Tail) Plates: 16–29.

Description: 12–19 upper labials; 14–21 lower labials; first lower labials usually divided transversely; maximum length 1625 mm.

Color: General coloration pink, brick-red, or reddish brown; pattern of 29–41 (average 36) dark blotches, rhombic or roughly diamond-shaped, with incomplete light borders; lateral markings obscure; head nearly unicolor above, pattern obsolescent; light postocular line, if present, 2 scales wide; tail white or light grey with black rings (3–7 in males, 2–5 in females).

Distribution: California; Baja California and northern Mexico; Texas, south of New Mexico.

Mohave Rattlesnake; (*Crotalus scutulatus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

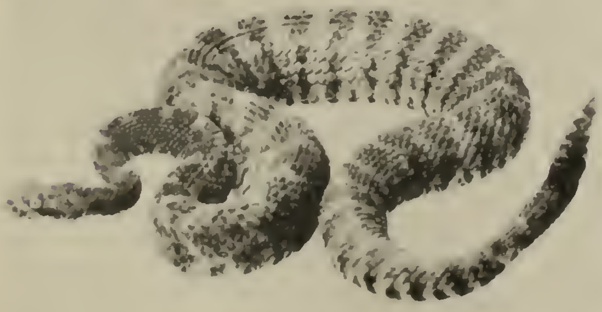
Identifying Characteristics: Dorsal (Back) Scale Rows: 25–27; Ventral (Belly) Plates: 167–170; Subcaudal (Tail) Plates: 18–20; Anal Plates: entire.

Description: Canthus rostralis distinct; rostral as deep as broad, in contact with the anterior nasal; upper surface of head with small shields; two pairs of prefrontals; 2–3 series of shields between the supraoculars; supraoculars transversely striated, not broader than their distance from each other, in contact with 4–5 shields in addition to the pre- and postoculars; highly dangerous; length about 36–37 inches.

Color: Yellowish or greyish brown above, with a series of large dark brown light-edged rhombs; a yellowish streak from the canthus rostralis along the supraocular border to the middle of the temple; an oblique dark streak below the eye; uniform yellowish white beneath.

Distribution: Extreme southern Nevada, western and southern Arizona south through the highlands of Mexico.

Tiger Rattlesnake (*Crotalus tigris*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



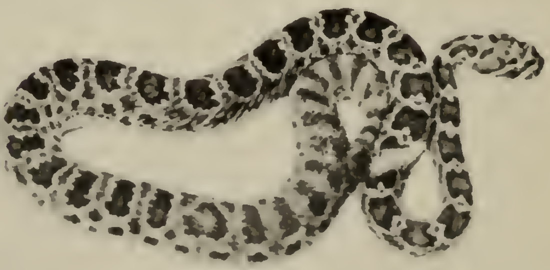
Identifying Characteristics: Dorsal (Back) Scale Rows: 23–25; Ventral (Belly) Plates: 166–181; Subcaudal (Tail) Plates: 26–46; Anal Plates: entire.

Description: Snout with distinct canthus; rostral broader than deep, in contact with anterior nasal and a pair of internasals; a large shield on each side between the internasal and the supraocular; middle of snout covered with small smooth or obtusely keeled scales; supraoculars narrower than the space between them, which is occupied by 6 longitudinal rows of keeled scales; 3 series of scales between the eye and the labials; 13–15 upper labials; dorsal scales strongly keeled; length about 28 inches; highly dangerous.

Color: Yellowish or pale brown above, with a dorsal series of brown, dark-edged spots, widening to crossbands posteriorly; sides with smaller dark spots; head with small dark spots and a dark streak from the eye to the angle of the mouth; yellowish beneath, scantily spotted with brown.

Distribution: Narrow strip from Phoenix, Arizona south through Sonora, Mexico; southern California, Nevada, Colorado, and Durango, Mexico.

Prairie Rattlesnake; (*Crotalus viridis viridis*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 23–29; Ventral (Belly) Plates: 164–196; Subcaudal (Tail) Plates: 16–31.

Description: 10–18 upper labials; 11–19 lower labials; more than 2 nasals (usually 4); minimum scales between supraocular usually more than 2; minimum scales between supraoculars usually more than 2; maximum length 1448 mm.

Color: Greenish grey, olive green, or greenish brown; pattern of 33–55 (average 43) dark brown subquadrate or subelliptical blotches, which become wider and shorter, forming crossbands posteriorly; blotches usually with narrow white borders; 2–3 series of inconspicuous lateral spots; tail rings in males 6–15, in females 4–11, only the last 2–3 black; usually a white dash or triangle on supraoculars, a diagonal white line from preoculars to labials and a similar line from postoculars backward above angle of mouth; all white markings are less conspicuous in specimens from northern parts of the range.

Distribution: The Great Plains region of North America from southern Alberta and southwestern Saskatchewan to northeastern Sonora, northern Chihuahua, and west-central Texas; from the Rocky Mountains eastward through the central portions of North and South Dakota and north-central Nebraska to extreme western Iowa, central Kansas, and Western Oklahoma. Toward the west it has spread through gaps in the Rocky Mountains to eastern Idaho, Southeastern Utah, and northeastern Arizona.

Arizona Ridge-nosed Rattlesnake; (*Crotalus willardi*); Family: *Crotalus;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–27 (rarely 29); Ventral (Belly) Plates: 147–159; Subcaudal (Tail) Plates: 21–30; Pre- and Post-Ocular Shields: 2 and 3–7.

Description: 12–15 upper labials; 12–16 lower labials; tip of the snout and anterior canthus rostralis raised in a sharp ridge; rostral and mental marked by a light central vertical line on a red-brown color; top of parietal substantially square; rostral higher than wide; internasals 2; canthals 2–4, usually 3; eye separated from labials by two scales; loreals 1–3, usually 2; 1–9 distal subcaudals divided, rest single; supraoculars reduced in size and scales in the prefrontal and parietal areas small and numerous; length about 600 mm maximum.

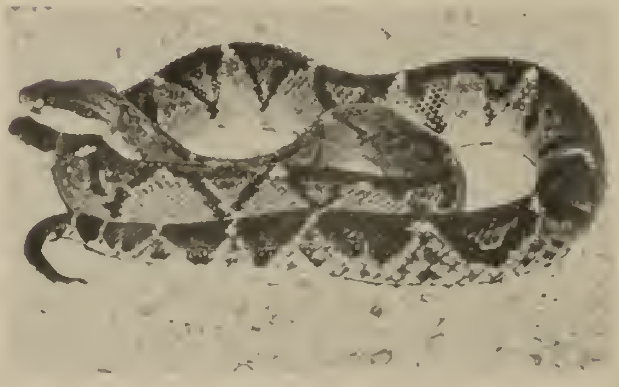
Color: Ground color above a warm tone of yellowish brown; dorsal pattern of 19–26 dorsal blotches, subquadrate in shape with a trace of dark brown borders on anterior and posterior edges, but fading gradually into ground color on the sides, and separated on the middorsal line by narrow transverse areas of yellowish grey; lateral spots small, indistinct, and in 3 series; tail usually with one blotch at base, similar to those of body, followed by a median longitudinal stripe and two less distinct lateral stripes; base of rattle brown; ventral surface cream or buff, more or less heavily mottled and strippled with dark brown or brownish black; head brown with a few irregularly placed dark brown flecks above; first 4–5 upper labials tipped with white below; a median vertical light line usually present on rostral and mental; throat white or cream with 2 elongate brown blotches bordering the angle of the mouth on each side.

Distribution: Arizona and northern Mexico.

Bushmaster, Sirocucu, Mapipire, Mapana, cascabel, cascavel (*Lachesis muta*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 32–37; Ventral (Belly) Plates: 200–230; Subcaudal (Tail) Plates: 32–50; Anal Plates: entire.

Description: Rostral as deep as broad or a little broader than deep; nasal divided; upper head-scales very small, granular, smooth or obtusely keeled; supraocular, narrow; 2–3 scales separating the internasals in front; 10–15 scales on a line between the supraoculars; 4–5 series of scales between the eye and the upper labials; temporal scales obtusely keeled; 9–10 upper labials, lower labials, 14; second upper labial usually forming the anterior border of the loreal pit, the third very large; dorsal scales tubercularly keeled, feebly imbricate; subcaudals greater part paired, except the terminal 12 appear to be in 3–4 rows, caused by very small keeled scales covering the end of the tail; length up to 12–14 feet; extremely long fangs, up to 1⅜ inches long; tail 170 mm.



Color: Yellowish or pinkish above, with a series of large rhomboidal dark brown or black spots enclosing smaller light spots; a black streak from the eye to the angle of the mouth.

Distribution: Honduras, Nicaragua, Guatemala, Costa Rica, San Salvador, Panama, Colombia, Venezuela, British Guiana, Surinam, French Guiana, Ecuador, Brazil, and Trinidad-Tobago.

Arizona Coral Snake; (*Micruroides euryxanthus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 215–241; Subcaudal (Tail) Plates: 21–29; Anal Plates: divided; Temporal (Head) Shields: 1–2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye much shorter than its distance from the mouth; rostral large, nearly as deep as broad, its upper portion nearly as long as its distance from the frontal; internasals nearly as long as the prefrontals; frontal small and narrow; parietals small; 7 upper labials, 3rd and 4th touching the eye, 7th very small; chin shields very short, the anterior in contact with 3 lower labials; length 400 mm; tail 33 mm.

Color: Body with 11 or more black annuli edged with white and separated by broad red interspaces; head black to the posterior border of the parietals; dorsal red scales may be spotted with black; tail with two white and three black bands; tip of tail black.

Distribution: Southeastern Arizona, Sonora, and northwestern Mexico.

Coral Snake; (*Micrurus coralinus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 179–231; Subcaudal (Tail) Plates: 30–47; Anal Plates: divided; Temporal (Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2 (rarely 1).

Description: Eye measuring ⅔ to ¾ its distance from the mouth in the adult; rostral broader than deep; frontal a little broader than the supraocular; parietals as long as their distance from internasals; anterior temporal sometimes fused with the 6th upper labial; 6 upper labials, 3rd and 4th about same size and touching eye; 3 or 4 lower labials in contact with anterior chin shields; nasal divided; loreal absent; subcaudals paired (rarely a few single); semielliptical small pupil; length 790 mm; tail 70 mm.

Color: Body with black annuli edged with yellow, separated by red interspaces which may be more or less profusely spotted with black; head black above temples, and often a more or less broad band behind or partly on the parietals yellow.

Distribution: Tropical South America and Lesser Antilles (St. Thomas, St. Vincent, Martinique), Trinidad and Tobago Is. Argentina, Uruguay, Paraguay, Colombia, Ecuador, Venezuela, British Guiana, Surinam, French Guiana.

Coral Snake; (*Micrurus elegans*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 189–221; Subcaudal (Tail) Plates: 29–47; Anal Plates: divided; Temporal (Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye nearly as long as its distance from the mouth; rostral much broader than deep; frontal broader than the supraocular, slightly shorter than the parietals; latter as long as their distance from the internasals; 7 upper labials, 3rd larger than 4th, 3rd and 4th touching eye; 4 lower labials in contact with the anterior chin shields, which are shorter than the posterior ones; subcaudals paired (rarely a few single); length 730 mm; tail 70 mm.

Color: Body with black annuli disposed in threes, subequal in size, separated, within each set, by two series of alternately black and yellow scales; the sets 12 to 17 in number, narrowly separated by reddish-brown interspaces which may be divided by a black crossbar; head black, with a yellow blotch on each side behind the eye, widening on the lip.

Distribution: Mexico, British Honduras, Guatemala.

Southern Coral Snake; (*Micrurus frontalis*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15 Ventral (Belly) Plates: 197–230; Subcaudal (Tail) Plates: 15–26; Anal Plates: divided; Temporal (Head) Shields: 1 + 1 (Rarely 1 + 2); Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye measuring ⅔ to ¾ its distance from the mouth in the adult, as long as its distance from the mouth in the young; rostral a little broader than deep frontal as broad as or slightly broader than the supraocular, shorter than parietals; latter a little long than their distance from the internasals; 7 upper labials, 3rd larger than 4th, 3rd and 4th touching the eye; 3 or 4 lower labials in contact with the anterior chin shields, which are as long as or shorter than the posterior ones; tail ending very obtusely; length 1350 mm.

Color: Body with gaudy pattern of red, yellow and black bands of varying widths which encircle body; red bands are separated from yellow by black bands; yellow bands are likewise separated from red bands by black ones; the red and yellow scales tipped with black; upper surface of head, as far as the posterior border of the parietals, black; the shields edged or spotted with yellow or red; parietals often red in front.

Distribution: Brazil, Argentina, Uruguay, Paraguay.

Coral Snake; (*Micrurus fulvius*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 180–237; Subcaudal (Tail) Plates: 30–59; Anal Plates: divided (rarely single); Temporal (Head) Plates: 1 + 1 (rarely 1 + 2); Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye shorter than its distance from the mouth in the adult; rostral broader than deep; frontal as broad as or broader than the supraocular, and shorter than the parietals; latter longer than their distance from the internasals; 7 upper labials, 3rd usually larger than 4th, 3rd and 4th touching the eye; 3 or 4 lower labials in contact with the anterior chin shields, which are shorter than the posterior ones; very poisonous; length 990 mm; tail 85 mm.

Color: Body annulate, black and red or black, yellow, and red; tail annulate black and yellow; snout black; shields usually entirely or greater part yellow, the first black annulus just behind or encroaching a little upon the parietals.

Distribution: Eastern North America, from southern Virginia, the Ohio River, and the Missouri to the Rio Grande; Mexico, Central America, British Honduras, Nicaragua, Honduras, Guatemala, San Salvador, Panama, and Costa Rica.

Coral Snake; (*Micrurus hemprichii*) ; Family: *Elapidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 168–181; Subcaudal (Tail) Plates: 22–29; Anal Plates: entire; Temporal (Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye measuring about ⅔ its distance from the mouth; rostral scarcely broader than deep; frontal broader than the supraocular, a little shorter than the parietals; latter as long as their distance from the internasals; 7 upper labials, 3rd larger than 4th, 3rd and 4th touching the eye; four lower labials in contact with anterior chin shields, which are as long as the posterior ones; length 720 mm; tail 65 mm.

Color: Black above, with yellowish (red?) annuli, one broad one between two narrow ones; upper head-shields black; upper lap, temples, and occiput behind the parietal shields yellowish; the yellowish scales black-edged; the yellowish annuli widening on the belly.

Distribution: British and French Guiana, Trinidad and Tobago Is., Venezuela, Colombia, Ecuador, Paraguay, Peru, Surinam.

Coral Snake; (*Micrurus lemniscatus*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 241–262; Subcaudal (Tail) Plates: 30–39; Anal Plates; divided; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye measuring about half its distance from the mouth; rostral broader than deep; frontal broader than the supraocular, and shorter than parietals latter longer than their distance from the internasals; 7 upper labials, 3rd much larger than 4th, 3rd and 4th touching the eye; 4 lower labials in contact with anterior chin shields which are as long as or a little longer than the posterior ones; length 1000 mm; tail 80 mm.

Color: Body with black annuli disposed in threes, subequal in width or middle ones a little larger; 11–14 sets of annuli, separated by more or less broad red interspaces which, like the narrow yellow annuli within each set, may be dotted or the scales edged with black; head yellow; end of snout and a band across the middle of the head black; often a roundish black spot on the occiput.

Distribution: Argentina, Brazil, British and French Guiana, Surinam.

Coral Snake; (*Micrurus mipartitus*) ; Family *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 210–278; Subcaudal (Tail) Plates: 24–34; Anal Plates: divided; Temporal (Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye about half to ⅗ as long as its distance from the mouth; rostral broader than deep; frontal broader than supraocular, shorter than parietals; latter slightly longer than their distance from the internasals; anterior temporal very narrow, sometimes absent; 7 upper labials, 3rd much larger than 4th, 3rd and 4th touching eye; 3 or 4 lower labials in contact with anterior chin shields, which are as long as or a little shorter than the posterior ones; length 610 mm; tail 50 mm.

Color: Black above, with 40–70 narrow red crossbars (and about the same number of black rings—the largest number of any coral snake) which widen on the belly, which is barred black and red; the red dorsal scales often each with a black spot; tail red, with 2–5 black annuli; head black to between the eyes, then yellow to the posterior border of the parietals.

Distribution: Nicaragua, Costa Rica, Panama, Venezuela, Colombia, Honduras, San Salvador, Ecuador, Peru.

Coral Snake; (*Micrurus narducci*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 240–315; Subcaudal (Tail) Plates: 15–33; Anal Plates: divided; Temporal (Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye hardly half as long as its distance from the mouth; rostral broader than deep; frontal nearly as broad as the supraocular, shorter than the parietals: 7 upper labials, 3rd and 4th touching the eye; anterior chin shields in contact with the mental and with three or four lower labials; posterior chin shields as long as the anterior; length 720 mm; tail 50 mm.

Color: Black beneath, with yellow (red?) crossbands or transversely oval spots, as broad as or narrower than the interspaces and sometimes extending as triangular blotches up the sides; a yellow crossband on the head, covering the temples, the frontal, supraoculars, and the anterior half of the parietals.

Distribution: Ecuador, Peru, Bolivia.

Coral Snake; (*Micrurus psyches*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 188–214; Subcaudal (Tail) Plates: 32–47; Anal Plates: divided; Temporal (Head) Shields: 1 + 1 (rarely 1 + 2); Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye measuring ⅔ its distance from the mouth; rostral broader than deep; frontal broader than the supraocular, shorter than the parietals; latter longer than their distance from the internasals; 7 upper labials, 3rd a little larger than 4th, 3rd and 4th touching the eye; four lower labials, in contact with the anterior chin shields, which are shorter than the posterior ones; length 495 mm; tail 80 mm.

Color: Body annulate alternately black and dark brown, with 48–52 more or less distinct narrow yellowish rings; head black, with a triangular yellow spot on each side behind the head, the point touching the parietal shield.

Distribution: British and French Guiana and Surinam.

Giant Coral Snake; (*Micrurus spixii*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

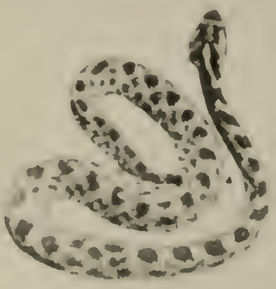
Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 201–219; Subcaudal (Tail) Plates: 22–29; Anal Plates: divided (rarely single); Temporal (Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye measuring ⅔ its distance from the mouth in the adult, as long as its distance from the mouth in the young; rostral broader than deep; frontal as broad as or a little broader than the supraocular, shorter than the parietals; latter a little longer than their distance from the internasals; 7 upper labials, 3rd larger than 4th, 3rd and 4th touching eye; four lower labials in contact with anterior chin shields, which are shorter than the posterior ones: length 1400 mm; tail 70 mm.

Color: Red, the scales mostly tipped with black, with 20–38 subequal black rings on the body, as broad as or narrower than the interspaces, disposed more or less distinctly in threes; the first black ring extends to the posterior border of the parietals; upper head shields black or largely spotted with black, with a more or less distinct black crossband passing through the eyes; a black occipital collar, followed by a wide red space.

Distribution: Venezuela and Northern Brazil.

Massasauga (means "great river mouth" in the Chippewa Indian language) Pigmy Rattlesnake; (*Sistrurus catenatus*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*



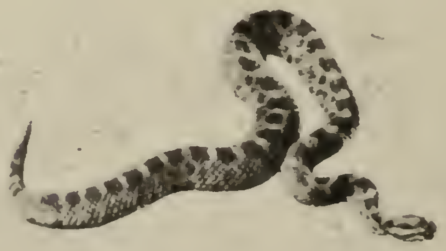
Identifying Characteristics: Dorsal (Back) Scale Rows: 21–27 (23); Ventral (Belly) Plates: 129–157 (140); Subcaudal (Tail) Plates: 19–33 (26).

Description: Distinguished from *S. miliarius*, by having the upper preocular in contact with the posterior nasal above the loreal, which is very small; 2–3 series of scales between the eye and the labials; temporal scales smooth; 9–14 upper labials and 10–16 lower labials; length 680 mm; tail 80 mm.

Color: A dark spot on the parietal shields, between the two occipito-nuchal stripes; a light streak from the loreal pit to the angle of the mouth; dorsal spots usually larger than in *S. miliarius*, transversely elliptic or reniform.

Distribution: Canada, U.S., from shores of Lake Huron to the Rio Grande. Rare or lacking 20 miles north of the Great Lakes; not found east of Brazos River nor in Arkansas except the northwest tip; frequents bogs, swamps, and other poorly drained areas.

Western Pigmy Rattlesnake, Carolina or Southern Rattlesnake, Dusky Pigmy Rattlesnake; (*Sistrurus miliarius*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 21–25 (23); Ventral (Belly) Plates: 122–140 (133); Subcaudal (Tail) Plates: 25–37 (31); Anal Plates: entire.

Description: Snout with sharp canthus; rostral as deep as broad or a little deeper than broad; frontal as long as its distance from the end of the snout, shorter than the parietals; upper preocular separated from the posterior nasal by a loreal; eye separated from the labials by 1–2 series of scales; temporal scales keeled; 9–12 upper labials, 10–13 lower labials; rattle short, 10 being the highest number of segments on record; length 520 mm; tail 70 mm.

Color: Greyish, yellowish, or brown above, the vertebral line often orange; 1–2 dorsal series of large dark, black-edged spots, or a series of narrow crossbars, and one or two lateral series of smaller spots; two undulating dark stripes from between the eyes to the occiput, the space between them usually orange; a dark temporal streak with a light streak below it extending from below the center of the eye to the angle of the mouth; whitish beneath, speckled and spotted with dark brown or black.

Distribution: North Carolina south to southern Florida and west to central Oklahoma and Texas.

3. Snakes of Africa

1. Aspis cerastes
2. Aspis vipera
3. Atheris ceratophorus
4. Atheris chlorechis
5. Atheris nitschei
6. Atheris squamigera
7. Atractaspis aterrima
8. Atractaspis bibronii
9. Atractaspis congica
10. Atractaspis corpulenta
11. Atractaspis dahomeyensis
12. Atractaspis irregularis
13. Atractaspis leucomelas
14. Atractaspis microlepidota
15. Bitis arietans
16. Bitis atropos
17. Bitis caudalis
18. Bitis cornutus
19. Bitis gabonica
20. Bitis inornata
21. Bitis nasicornis
22. Bitis peringueyi
23. Boulengerina annulata annulata
24. Boulengerina annulata stormsi
25. Causus defilippi
26. Causus lichtensteinii
27. Causus resimus
28. Causus rhombeatus
29. Dendroaspis angusticeps
30. Dendroaspis jamesoni
31. Dendroaspis polylepis antinorii
32. Dendroaspis polylepis polylepis
33. Dendroaspis viridis
34. Dispholidus typus
35. Elapsoidea guentheri
36. Hemachatus haemachates
37. Naja anchietae
38. Naja flava
39. Naja goldii
40. Naja haje
41. Naja melanoleuca
42. Naja nigricollis
43. Thelotornis kirtlandi
44. Vipera lebetina mauritanica
45. Vipera superciliaris

Horned Viper; (*Aspis cerastes*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Black) Scale Rows: 27–35; Ventral (Belly) Plates; 130–165; Subcaudal (Tail) Plates: 25–42; Anal Plates: entire.

Description: Snout very short and broad; rostral small, twice to thrice as broad as deep; head covered with small tubercularly keeled scales of unequal size above, 15–21 across from eye to eye; a large erect, ribbed, horn-like scale often present above the eye; 14–18 scales around the eye; 4–5 series of scales between the eye and the labials; nostril in a single small shield, separated from its fellow by six to eight longitudinal series of scales and from the rostral by 2–3 (rarely 1); 12–15 upper labials; 3 lower labials in contact with the chin shields; ventrals with a very feeble lateral keel; subcaudals in 2 rows, the posterior more or less distinctly keeled; length 720 mm; tail 90 mm.

Color: Pale yellowish brown or grey above, with or without brown spots, forming 4 or 6 regular longitudinal series, the two middle ones sometimes confluent, forming crossbars; a more or less distinct oblique dark streak behind the eye, lower parts white; end of tail sometimes black.

Distribution: Spanish Sahara, Mauritania, Senegal, French Sudan, Nigeria, Niger Chad, Somalia, Sudan Egypt, Libya, Tunisia, Algeria, Morocco, Central African Republic, Ethiopia, Arabia, Southern Palestine.

N.B.—*Cerastes cornutus* is a synonym for this species.

Aspis vipera; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23–27; Ventral (Belly) Plates: 102–122; Subcaudal (Tail) Plates: 18–26; Anal Plates: entire.

Description: Snout very short and broad; rostral small, 2–3 times as broad as deep; head covered with small, tubercularly keeled, unequal or subequal scales above, 9–13 across from eye to eye; no "horns"; 9–14 scales around the eye; 3–4 series of scales between the eye and the labials; nostril between two small shields, separated from their fellows by 5–6 series of scales and from the rostral by 1–2; 10–12 upper labials; 3 lower labials in contact with the chin shields; ventrals strongly keeled laterally; subcaudals paired, small, and often more or less distinctly keeled; length 340 mm; tail 30 mm.

Color: Yellowish, pale brown, or reddish above, with or without darker spots; end of tail often black; lower parts white.

Distribution: Northern border of the Sahara, from Algeria to Egypt, French Sudan, Mauritania, Spanish Sahara, Nigeria, Niger, Chad, Somalia, Sudan, Central African Republic.

N.B.—*Cerastes vipera* is a synonym for this species.

Horned Tree Viper; (*Atheris ceratophorus*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–25; Ventral (Belly) Plates: 144–152; Subcaudal (Tail) Plates: 41–56; Anal Plates: entire.

Description: Rostral twice and a half as broad as deep; head scales strongly keeled, 9–10 across the interorbital region; 3 erect, horn-like, supraocular scales, the longest as long as the eye; 16–17 scales around the eye; 2 series of scales between the eye and the labials; nostrils between two nasals; 10–11 upper labials; a pair of chin shields in contact with four lower labials on each side; gular scales keeled; dorsal scales strongly keeled; subcaudals single; length (max.) 422 mm.

Color: Dark olive above, with black spots forming more or less regular cross bands; pale olive beneath, speckled with black.

Distribution: Occurs in central Africa from Ghana to Tanganyika (including Upper Volta).

West African Tree Viper; (*Atheris chlorechis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–36; Ventral (Belly) Plates: 154–165; Subcaudal (Tail) Plates: 53–62; Anal Plates: entire.

Description: Rostral at least 3 times as broad as deep; head scales strongly keeled, 9–11 across the crown from eye to eye; 15–17 scales around the eye; 1 or 2 series of scales between the eye and the labials; nasal entire or semidivided; 9–12 upper labials; 2 pairs of small chin shields, the anterior in contact with the first or first and second lower labials; gular scales keeled; dorsal scales strongly keeled; subcaudals single; pupil elliptical; length 520 mm; tail 85 mm.

Color: Dorsal surface from snout to tail dark green; last portion of tail very dark; ventral surface of head bluish as is the ventral surface of tail; dorsal surface speckled with gold; ventrals uniformly paler green.

Distribution: Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Uganda.

Tree Viper, Leaf Viper "Kisigosogo" in Lugishu language; "Nalukonge" and "Kyozima" in Lugarde language; (*Atheris squamigera*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15–25; Ventral (Belly) Plates: 153–173; Subcaudal (Tail) Plates: 51–65; Anal Plates: entire.

Description: Rostral at least 3 times as broad as deep; head scales strongly keeled, or smooth between the eyes, 7–8 across the crown from eye to eye; 10–15 scales around the eye; 1–2 series of scales between the eye and the labials; nasal entire or divided; 9–12 upper labials (4th sometimes touching the eye); a pair of small chin shields in contact with 1, 2, or 3 lower labials on each side; gular scales keeled; dorsal scales strongly keeled, often an even number of rows; subcaudals single; 500–700 mm in length; tail about 100 mm.

Color: Olive above, uniform or with more or less regular, narrow, yellow crossbands, or yellow with small green spots; pale olive to yellowish marbled with darker yellowish or black, or uniform yellow.

Distribution: Sierra Leone, Portuguese and French Guinea, Ghana, Togo, Dahomey, Upper Volta, Nigeria, Cameroon, Cameroun (Fr.), Niger, Chad, Congo, Central African Republic, Gabon, Republic of Congo, Angola, Tanganyika, Kenya, Uganda, Ruanda-Urundi, Sudan. This species is remarkably absent from Liberia, the western end of the Rain Forest.

Nitsche's Tree Viper; Bush Viper; Green Viper; called "Rugondo" by the Bakiga natives. (*Atheris nitschei*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–32; Ventral (Belly) Plates: 141–162; Subcaudal (Tail) Plates: 35–75; Anal Plates: single.

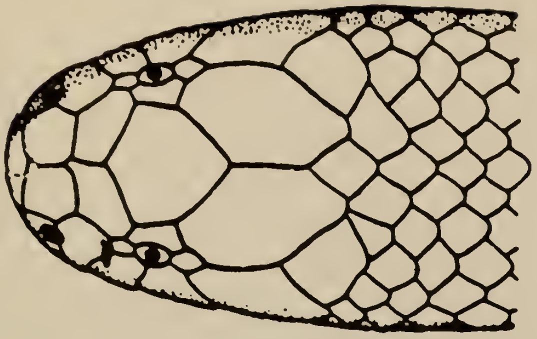
Description: Much more heavy-bodied than *A. squamigera;* has a reversed "V"- or "A"-shaped marking on the head; a zigzag dorsal band; pupil elliptical, head covered with small beaded scales.

Color: Ground color varies from olive green to bright green above, from yellowish to pale green beneath, the keels of most of the scales are black and the upper head scales are edged with black; tips of tails of juveniles are ivory white but the end of the tail is black or blackish in the adult.

Distribution: Uganda, Ruanda-Urundi, Republic of Congo.

Burrowing Viper, Mole Viper (*Atractaspis aterrima*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 251–300; Subcaudal (Tail) Plates: 18–24; Anal Plates: entire; Temporal



(Head) Shields: 1; Pre- and Post-Ocular Shields: 1 and 1.

Description: Snout rounded; portion of rostral visible from above measures ⅓ to ½ its distance from the frontal; suture between the internasals as long as or longer than that between the prefrontals; frontal as long as broad, longer than its distance from the end of the snout, shorter than the parietals; a large temporal, wedged in between the 4th and 5th upper labials; 5 upper labials 3rd and 4th touching the eye; 4th largest; 1st lower labials in contact with each other behind the mental; 3 lower labials in contact with the chin shields, 3rd extremely large; length 650 mm; tail 30 mm.

Color: Uniform dark brown to black.

Distribution: Ivory Coast, Ghana, Nigeria, Niger, Chad, Uganda, Northern Rhodesia, Central African Republic, Republic of Congo, Togo, Dahomey, Portuguese Guinea, Ethiopia, Cameroon, Camerouns, Upper Volta.

Burrowing Viper; (*Atractaspis bibronii*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 221–260; Subcaudal (Tail) Plates: 20–23; Anal Plates: entire.

Description: Snout prominent, subcuneiform; portion of rostral visible from above as long as or a little shorter than its distance from the frontal; suture between the internasals nearly as long as that between the prefrontals; frontal as long as broad or slightly longer than broad, much longer than its distance from the end of the snout, as long as the parietals; one large temporal wedged in between the 4th and 5th upper labials; 5 upper labials, 3rd and 4th touching the eye, 4th largest; 1st lower labials in contact with each other behind the mental; 3 lower labials in contact with the anterior chin shields, 3rd extremely large; length 600; tail 25 mm; subcaudals all or greater part single.

Color: Dark purplish brown above, yellowish or pale brown beneath.

Distribution: Eastern districts of Cape Colony, Natal, Namaqualand, Angola.

Burrowing Viper; (*Atractaspis congica*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 200–230; Subcaudal (Tail) Plates: 19–23; Anal Plates: divided; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields; 1 and 1.

Description: Snout very short, rounded; portion of rostral visible from above about half as long as its distance from the frontal; suture between the internasals longer than that between the prefrontals; frontal slightly longer than broad, twice as long as its distance from the end of the snout, as long as the parietals; anterior temporal very large and wedged in between the 4th and 5th labials; 5 upper labials, 3rd and 4th touching the eye; 4th largest; 1st lower labials in contact behind the mental; 3 lower labials in contact with the chin shields, third extremely large; a few anterior subcaudals single, rest paired; length 450 mm; tail 35 mm.

Color: Uniform dark brown or black.

Distribution: Republic of Congo, Angola.

Burrowing Viper; (*Atractaspis corpulenta*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23–27: Ventral (Belly) Plates: 178–196; Subcaudal (Tail) Plates: 23–27; Anal Plates: entire; Temporal (Head) Shields: 1 + 3; Pre- and Post-Ocular Shields; 1 and 1.

Description: Snout strongly projecting, cuneiform; rostral large, its upper portion as long as its distance from the frontal; suture between the internasals a little shorter than that between the prefrontals; frontal as long as broad, much longer than its distance from the ocular; temporals 1 + 3; anterior very large and wedged in between the 4th and 5th labials: 5 upper labials 3rd and 4th touching the eye; 1st lower labials in contact with each other behind the mental; 2nd lower labials very large, fused with the chin shields and also forming a suture with each other; subcaudals all or greater part single; length up to 521 mm; tail 33 mm.

Color: Uniform blackish brown; tail sometimes white.

Distribution: Liberia, Ivory Coast, Ghana, Togo, Dahomey, Upper Volta, Nigeria, Cameroun (Fr.), Cameroons, Niger, Chad, Congo, Gabon, Central African Republic, Republic of Congo, Uganda.

Burrowing Viper; (*Atractaspis dahomeyenesis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

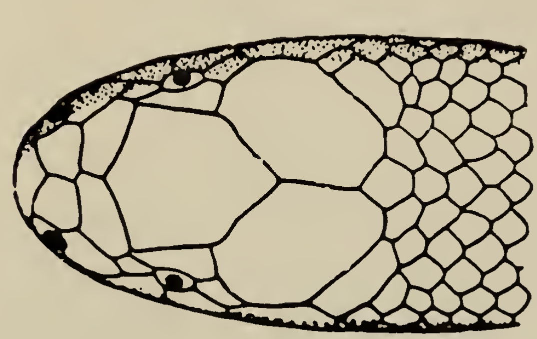
Identifying Characteristics: Dorsal (Back) Scale Rows: 29–31; Ventral (Belly) Plates: 218–240; Subcaudal (Tail) Plates: 24–27; Anal Plates: entire; Temporal (Head) Shields: 1; Pre- and Post-Ocular Shields: 1 pre.

Description: Snout prominent and cuneiform; postocular absent, fused with the supraocular; a large anterior temporal; five upper labials, 3rd and 4th touching the eye; mental in contact with the chin shields; 3rd lower labial very large; subcaudals partly single, partly paired; length 490 mm; tail 32 mm.

Color: Black above, brown beneath, the central plates edged with lighter color.

Distribution: Dahomey, Portuguese and French Guinea, Ivory Coast, Ghana, Togo, Upper Volta.

Burrowing Viper; (*Atractaspis irregularis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 25–27; Ventral (Belly) Plates: 220–257; Subcaudal (Tail) Plates: 22–29; Anal Plates: divided; Temporal (Head) Shields: 1; Pre- and Post-Ocular Shields: 1 and 1.

Description: Snout very short, rounded; portion of rostral visible from above measuring two thirds to three fourths its distance from the frontal; suture between the internasals longer than that between the prefrontals; frontal as long as broad, much longer than its distance from the end of the snout, as long as or slightly shorter than the parietals; a very large temporal wedged in between the 4th and 5th upper labials; five upper labials, third and fourth touching the eye, 4th largest; 1st lower labials in contact with each other behind the mental; 3 lower labials in contact with the chin shields, 3rd extremely large; subcaudals paired; length 578 mm; tail 35 mm.

Color: Uniform dark brown or black.

Distribution Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Upper Volta, Nigeria, Cameroons, Cameroun (Fr.), Niger, Chad, Ruanda-Urundi, Uganda, Kenya, Ethiopia, Eritrea, Sudan, Republic of Congo, Gabon, Congo, Central African Republic.

Burrowing Viper; (*Atractaspis leucomelas*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23; Ventral (Belly) Plates: 243; Subcaudal (Tail) Plates: 27; Anal Plates: entire; Temporal (Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 1 and 1.

Description: Snout very short; portion of rostral visible from above nearly as long as its distance from the frontal; suture between the internasals half as long as that between the prefrontals; frontal once and two fifths as long as broad, much longer than its distance from the end of the snout, as long as the parietals; temporals, small, scale-like; six upper labials, 3rd and 4th touching the eye, 4th largest; 1st lower labials forming a suture behind the mental; 3 lower labials in contact with the chin shields; subcaudals nearly all single; length 575 mm; tail 40 mm.

Color: Black above, with a white vertebral line, occupying one and two half rows of scales; ventrals and subcaudals, and 4 outer series of scales on each side, white; neck entirely black; head white, with a black blotch covering the nasals and the upper head shields.

Distribution: Somalia.

Burrowing Viper; (*Atractaspis microlepidota*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

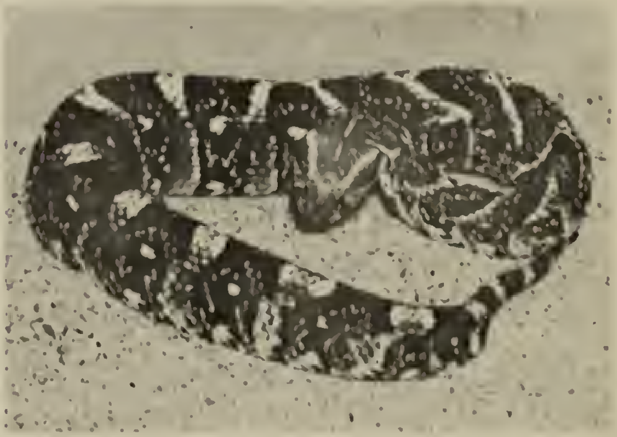
Identifying Characteristics: Dorsal (Back) Scale Rows: 29–37; Ventral (Belly) Plates: 212–245; Subcaudal (Tail) Plates: 26–37; Anal Plates: entire; Temporal (Head) Shields: 2 + 3 or 4; Pre- and Post-Ocular Shields: 1 and 1.

Description: Snout very short, prominent, subcuneiform; portion of rostral visible from above nearly as long as its distance from the frontal; suture between the internasals as long as that between the prefrontals; frontal a little longer than broad, much longer than its distance from the end of the snout, longer than parietals; temporals small; 6 upper labials, 3rd and 4th touching the eye and largest; 1st lower labials in contact with each other behind the mental; 3 lower labials in contact with the chin shields; subcaudals single; length 540 mm; tail 45 mm.

Color: Uniform dark brown.

Distribution: Sudan, Eritrea, Ethiopia, Fr. Somaliland, Rep. of Somali, Kenya, Tanganyika, Uganda, Ruanda-Urundi, Nigeria, Cameroons, Cameroun, Gabon, Rep. of Congo, Chad, Central African Republic, Congo, Upper Volta.

Puff Adder; (*Bitis arietans*); Family: *Viperidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 29–41; Ventral (Belly) Plates: 131–147; Subcaudal (Tail) Plates: 16–34; Anal Plates: entire.

Description: Head triangular, blunt snout, rostral small, not visible from above; all scales keeled; tail short and thick; slow moving, powerfully muscular; scales around eyes 12–16; gular (throat) shields not keeled; nostrils directed upwards only; no horns; vertically elliptical pupils; enormous fangs and deadly venom; bite almost certainly fatal unless prompt and effective treatment is provided; subcaudals paired; puff adders among few snakes depending on ventral plates for movement; length up to 1400 mm. tail 160 mm; 12–16 upper labials.

Color: Yellowish, pale brown, or orange above, marked with regular chevron-shaped dark brown or black bars pointing backwards, or black with yellow or orange markings; a large dark blotch covering the crown, separated from a smaller interorbital blotch by a transverse yellow line; an oblique dark band below and another behind the eye; yellowish white beneath, uniform or with small dark spots.

Distribution: All of Africa *except* Libya, and Tunisia; Saudi Arabia, Iraq, Lebanon, Israel, Palestine, Jordan.

N.B.—Color pattern is constant and brighter in young specimens.

Berg Adder; (*Bitis atropos*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 29–31; Ventral (Belly) Plates: 124–145; Subcaudal (Tail) Plates: 18–29; Anal Plates: entire.

Description: Nostrils turned upwards and outwards; rostral small, once and ⅔ to twice as broad as deep; head covered with small, imbricate, strongly keeled scales, 13–16 scales around the eye; 2–3 series of scales between the eye and the labials; 2–5 series of scales between the supranasals; 2 series of scales between the nasal and the rostral; 10–12 upper labials; 3–4 lower labials in contact with chin shields; fangs much smaller and venom not as potent as *B. arietans* but never-the-less deadly; frequently found on mountain ledges; hisses violently and twists convulsively when molested; a "bluffer"—reluctant to bite unless disturbed; pupils elliptical; length 350 mm; tail 25 mm.

Color: Brown or grey-brown above, with 4 longitudinal series of large, dark brown, black-and-white edged spots, formed by the breaking up into two of two series of subcircular spots; a continuous or interrupted whitish streak running between and dividing the spots on each side of the back, and another lower down on the sides; two large dark oblique, light, dark-edged streak from behind the eye to the mouth; belly grey or brown, spotted with darker color.

Distribution: Southwest Africa, Union of South Africa.

Horned Puff Adder, Horned Adder; (*Bitis caudalis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 22–29; Ventral (Belly) Plates: 112–153; Subcaudal (Tail) Plates: 18–33; Anal Plates: entire.

Description: Nostrils turned upwards and outwards; rostral small, once and ⅔ to twice and a half as broad as deep; head covered with small, imbricate, keeled scales, 12–16 across the vertex from eye to eye; a single, erect, horn-like scale usually present above the eye; 10–16 scales around the eye; 2–4 series of scales between the eye and the labials; 2–3 series of scales between the supranasals; two series of scales between the nasal and the rostral; 10–13 upper labials; 2–3 lower labials in contact with the chin shields; dorsal scales strongly keeled; outer row smooth or faintly keeled; subcaudals paired, well developed in males, scale-like and more or less distinctly keeled in the females; length 360 mm; tail 25 mm.

Color: Pale buff, reddish, or sandy grey above, with 2 series of brown spots with light centers and frequently a vertebral series of narrower spots; the spots may be edged with yellow; yellowish white beneath, uniform or with small blackish spots on the sides.

Distribution: Southwest Africa, Angola, Union of South Africa, Federation of Rhodesia and Nyasaland.

Horned Adder; (*Bitis cornutus*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–29; Ventral (Belly) Plates: 120–152; Subcaudal (Tail) Plates: 18–36; Anal Plates: entire.

Description: Nostrils turned upwards and outwards; rostral small, twice to twice and a half as broad as deep; head covered with small, imbricate, strongly keeled scales, 12–17 across the vertex from eye to eye; 2–5 scales above the eye raised, horn-like; 12–14 scales around the eye; three or four series of scales between the eye and the labials; 2–3 series of scales between the nasal and the rostral; 12–15 upper labials; 2–3 lower labials in contact with the chin shields; dorsal scales strongly keeled, outer row smooth or feebly keeled; subcaudals paired, well developed in males, scale-like and more or less distinctly keeled in the females; length 510 mm; total 35 mm.

Color: Greyish or reddish brown above, with dark brown spots, often edged with whitish, disposed in three or four longitudinal series, with or without light spots between them; head with more or less distinct symmetrical markings; an oblique dark streak from the eye to the mouth; yellowish white or brownish beneath, uniform or spotted with dark brown.

Distribution: Southwest Africa, Union of South Africa.

Gaboon Viper; (*Bitis gabonica*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 28–44; Ventral (Belly) Plates: 125–140; Subcaudal (Tail) Plates: 17–33; Anal Plates: entire.

Description: Nostrils directed upwards and outwards; rostral very small, once and a half to twice and a half

as broad as deep; head covered with small, moderately keeled scales, smallest on the vertex, 13–16 from eye to eye; 15–19 scales round the eye; 4–5 series of scales between the eye and the labials; a pair of more or less developed, compressed, erectile, triangular, sometimes bi- or tri-cuspid shields, in contact with each other, between the supranasals, forming a pair of nasal "horns"; 4–5 series of scales between the nasal and the rostral; 13–16 upper labials; 4–5 lower labials in contact with the chin shields; dorsal scales strongly keeled, outer row smooth; lateral scales slightly oblique, pointing downwards; subcaudals paired; length 1170 mm; tail 70 mm.

Color: Brown above, with a vertebral series of elongate, quadrangular, yellowish or light brown spots connected by hourglass-shaped dark brown markings; a series of crescentic or angular dark brown markings on each side; head pale above, with a dark brown median line; a dark brown oblique band behind the eye, widening towards the mouth; yellowish beneath, with small brown or blackish spots; ventral surface of the head ivory white.

Distribution: All of Africa *except:* Spanish Sahara, Mauritania, Senegal, French Sudan, Southwest Africa, Union of South Africa, Egypt, Libya, Tunisia, Algeria, and Morocco. It may also be found on the island of Zanzibar.

N.B.—The long fangs and virulence of the venom make it one of the deadliest of snakes in the world but this species is generally reluctant to bite unless stepped upon or subjected to severe provocation.

Cape Puff Adder; (*Bitis inornata*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 27–29; Ventral (Belly) Plates: 126–140; Subcaudal (Tail) Plates: 19–26; Anal Plates: entire.

Description: Intermediate between *B. atropos* and *B. cornutus;* eye smaller than in the former and separated from the labials by 4 series of scales; supraorbital region raised as in the latter, but without erect, horn-like scales; 15–17 scales across the head from eye to eye; 13–14 upper labials; 3 lower labials in contact with the chin shields; dorsal scales all keeled; subcaudals paired; length 350 mm; tail 30 mm; markings, if present, like *B. cornutus.*

Color: Two color forms: A. Dark yellowish brown above, with faint traces of darker markings, brownish yellow beneath with a few dark dots; head marbled with dark brown. B. Brown above, with two dorsal series of dark brown, black-edged spots.

Distribution: Union of South Africa, Federation of Rhodesia and Nyasaland.

Rhinoceros Viper, Rhinoceros-horned Viper, Nose-horned Viper, Horned Puff Adder, River Jack; (*Bitis nasicornis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 35–51; Ventral (Belly) Plates: 124–140; Subcaudal (Tail) Plates: 16–32; Anal Plates: entire.

Description: Nostrils directed upwards and outwards; rostral very small, once and a half to twice and a half as broad as deep; head covered with small strongly keeled scales, smallest on the vertex, 14–16 from eye to eye; 15–20 scales around the eye; 4–5 series of scales between the eye and the labials; 2–3 pairs of compressed, erectile, horn-like shields between the supranasals, usually separated in the middle by one or 2 series of small scales; one of these horn-like scales usually much developed; 4–6 series of scales between the nasal and the rostral; 15–18 upper labials; 4–6 lower labials in contact with the chin shields; dorsal scales strongly keeled, outer row smooth or feebly keeled; subcaudals paired; length 1250 mm; tail 125 mm.

Color: Purplish or reddish brown above, with pale olive and dark brown or black markings; a vertebral series of pale dark-edged spots, angularly notched in front and behind to receive a rhomboidal black spot; an arrow-headed dark brown yellow- and black-edged marking on the head and nape, the point on the snout; sides of head dark brown, with a triangular light marking in front of the eye and an oblique light streak from behind the eye to the mouth; pale olive beneath, speckled and spotted with blackish, or blackish olive speckled with yellowish.

Distribution: Portuguese and French Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Nigeria, Cameroons, French Cameroun, Niger, Chad, Congo, Gabon, Republic of Congo, Kenya, Uganda, Ruanda-Urundi, Sudan, Central African Republic.

N.B.—Known as the "Harlequin of the snake world," its enormous fangs and the virulence of its venom make it one of the deadliest snakes in the world; however, it is reluctant to bite unless stepped upon or subjected to severe provocation.

Peringuey's Adder; (*Bitis peringueyi*); Family; *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–27; Ventral (Belly) Plates: 130–132; Subcaudal (Tail) Plates: 19–28; Anal Plates: entire.

Description: Nostrils turned upwards and outwards; rostral small, broad, crescentic; head covered with small, strongly keeled scales, smallest on the vertex; 11 scales around the eye; 3 series of scales between the eye and the labials; nasal separated from the rostral by 2 series of scales; 11–14 upper labials; dorsal scales strongly keeled, outer row smooth; subcaudals paired; length 325 mm; tail 26 mm.

Color: Pale buff or greyish-olive above, with 3 longitudinal series of grey or blackish spots, the outer ocellar, enclosing a white center; head sometimes with a trident-shaped dark marking on the crown followed by a cross and two large markings on the occiput; whitish beneath, with small dark spots.

Distribution: Angola, Southwest Africa.

Water Cobra; (*Boulengerina annulata annulata*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 201–227; Subcaudal (Tail) Plates: 70–77; Anal Plates: entire; Temporal (Head) Shields: 1 + 2, Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral nearly as deep as broad, the portion visible from above measuring half its distance from the frontal; internasals shorter and a little broader than the prefrontals, extensively in contact with the preocular; frontal small, slightly longer than broad, as broad as the supraocular, as long as its distance from the rostral, slightly more than half the length of the parietals; posterior nasal in contact with the single preocular; temporals 1 plus 2; 7 upper labials, 3rd and 4th touching the eye, 4th, 5th, and 6th in contact with the lower postocular, 3rd and 6th deepest; 4 lower labials in contact with the anterior chin shields, which are much longer than the posterior ones; length up to 8 feet.

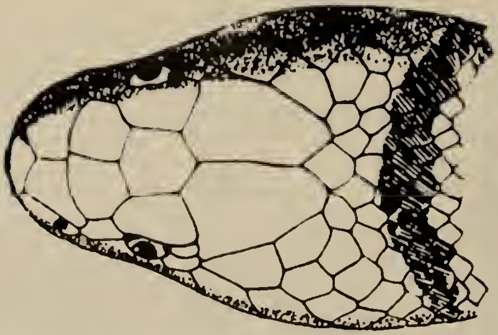
Color: Brown above with up to 20 or more black annular rings encircling entire body, glossy; belly whitish becoming darker towards posterior end; 4 black crossbars on nape of neck; shields are black-edged.

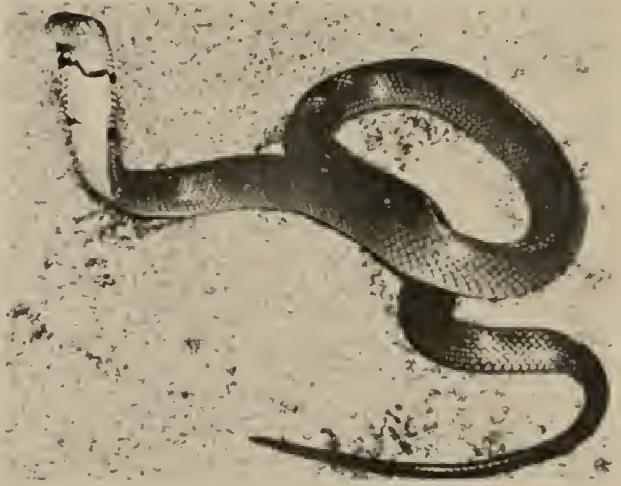
Distribution: Cameroons, Cameroun, Congo, Gabon, Republic of Congo, Federation of Rhodesia, and Nyasaland, Tanganyika, Kenya, Uganda, Ruanda-Urundi, Central African Republic.

N.B.—No completely effective antivenom available for treatment of a bite from this species, the venom of which contains a powerful neurotoxin. The snake can be found basking in the sun of early morning on rocks; tail not compressed laterally. This sub-species is the West African form.

Storm's Water Cobra, Water Cobra.; (*Boulengerina annulata stormsi*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 192–211; Subcaudal (Tail) Plates: 67–78; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.





Description: Similar to *B.a. annulata.*

Color: Differs from *B.a. annulata* in that the bands, which number 20 or more in the type sub-species, are restricted to two (rarely one or three). This sub-species represents the East African form.

Distribution: Same as *B.a. annulata.*

Night Adder; (*Causus defilippi*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

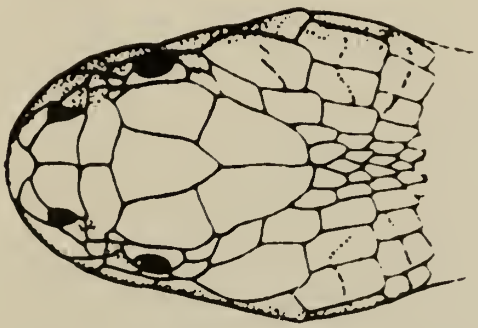
Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 113–225; Subcaudal (Tail) Plates: 10–18; Anal Plates: entire; Temporal (Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 2 and 2.

Description: Snout obtusely pointed, prominent, more or less turned up at the end; rostral large, T-shaped, with obtuse horizontal edge; its upper portion forming a right or acute angle behind and quite as long as its distance from the frontal; internasals longer than the prefrontals and forming a suture with the loreal; frontal once and a half to once and ⅔ as long as broad, as long as its distance from the end of the snout, longer than the parietals; 1–2 suboculars separating the eye from the labials; 6–7 upper labials; 3–4 lower labials in contact with the very short anterior chin shields; posterior chin shields very small or indistinct; dorsal scales feebly keeled; subcaudals paired; length 400 mm; tail 22 mm.

Color: Grey or pale brown above, vertebral region darker, with a series of large rhomboidal or V-shaped dark brown spots; a large Λ-shaped dark brown marking on the occiput, the point on the frontal; an oblique dark streak behind the eye; upper labials black-edged; yellowish white beneath, uniform or with small greyish-brown spots.

Distribution: Sudan, Eritrea, Ethiopia, Somali Republic and French Somaliland, Kenya, Tanganyika, Ruanda-Urundi, Mozambique, Transvaal, Nigeria, Cameroons, Fr. Cameroun, Gabon, Republic of Congo, Chad, Central African Republic, Congo, Federation of Rhodesia and Nyasaland.

Lichtenstein's Night Adder or Olive-green Viper; (*Causus lichtensteinii*); Family: *Viperidae;* Fang Group: *Solenoglypha.*



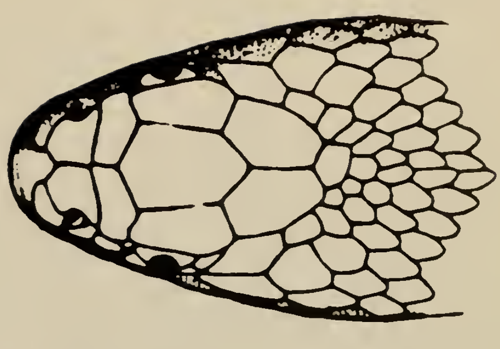
Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 133–152; Subcaudal (Tail) Plates: 15–22; Anal Plates: entire; Temporal (Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 2 and 2.

Description: Snout obtuse; rostral a little broader than deep, obtuse-angled above, its upper portion not half as long as its distance from the frontal; internasals longer than the prefrontals, separated from the loreal; frontal once and ⅓ as long as broad, as long as its distance from the end of the snout, as long as the parietals; 1–2 suboculars separating the eye from the labials; 6 upper labials; 4 lower labials in contact with the anterior chin shields; posterior chin shields very small; dorsal scales feebly keeled; subcaudals single; length 413 mm; tail 35 mm.

Color: Greyish above, with rather distinct darker chevron-shaped crossbands pointing forwards or, in some specimens, backwards, but in both cases are indistinct. The backwards direction is probably more common. Juvenile coloration includes distinct white lines on the head.

Distribution: Liberia, Ivory Coast, Ghana, Togo, Dahomey, Nigeria, Cameroons, French Cameroun, Niger, Chad, Central African Republic, Congo, Gabon, Republic of Congo, Kenya, Uganda, Eritrea and Sudan.

Green Night Adder, Night Adder, Green Viper; (*Causus resimus*); Family: *Viperidae;* Fang Group: *Solenoglypha.*



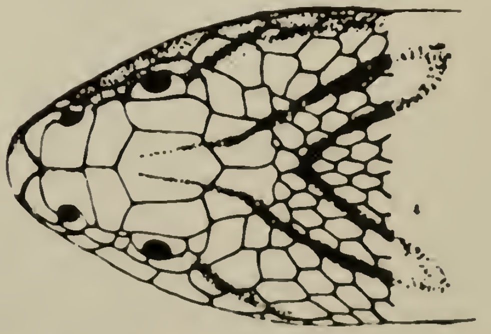
Identifying Characteristics: Dorsal (Back) Scale Rows: 19–22; Ventral (Belly) Plates: 134–152; Subcaudal (Tail) Plates: 17–25; Anal Plates: entire; Temporal (Head) Shields: 2 + 3–4; Pre- and Post-Ocular Shields: 2 and 2.

Description: Snout more prominent than in *C. rhombeatus*, often more or less distinctly turned up at the end, the rostral with obtuse horizontal edge; rostral broader than deep, forming nearly a right angle above, its upper portion measuring ½ to ⅔ its distance from the frontal; internasals longer than the prefrontals, separated from or just touching the loreal; frontal once and a half as long as broad, as long as or longer than its distance from the end of the snout, longer than the parietals; 1–2 suboculars separating the eye from the labials; 6 upper labials; four lower labials in contact with the anterior chin shields; posterior chin shields very small or indistinct; subcaudals paired; length 470 mm; tail 40 mm.

Color: Greyish-olive above, uniform or with curved or chevron-shaped black crossbars pointing backwards; uniform white beneath.

Distribution: Sennar, Sudan, Eritrea, Ethiopia, French Somaliland, Somali Republic, Kenya, Tanganyika, Uganda, Ruanda-Urundi, Nigeria, Cameroons, French Cameroun, Gabon, Republic of Congo, Chad, Central African Republic, Congo, Angola.

Common Night Adder, African Night Adder, Demon Night Adder, Cape Night Adder; (*Causus rhombeatus*); Family: *Viperidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 17–21; Ventral (Belly) Plates: 120–155; Subcaudal

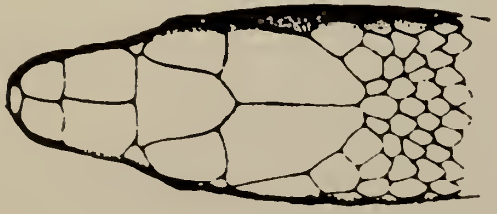
(Tail) Plates: 15–29; Anal Plates: entire; Temporal (Head) Shields: 2 + 3–4; Pre- and Post-Ocular Shields: 2–3 and 1–2.

Description: Snout obtuse, moderately prominent; rostral rounded, its upper portion forming a right or obtuse angle behind and measuring one half to ⅔ its distance from the frontal; internasals as long as or a little longer than the prefrontals, often forming a suture with the loreal; frontal once and a half to once and ¾ as long as broad, as long as or longer than its distance from the end of the snout, longer than the parietals; 1–2 suboculars separating the eye from the labials; 6 upper labials; 3–4 lower labials in contact with the anterior chin shields; posterior chin shields small or indistinct; dorsal scales more or less distinctly keeled; subcaudals all or greater part in pairs; length 700 mm; tail 75 mm.

Color: Olive or pale brown above, rarely uniform, usually with a dorsal series of large rhomboidal or V-shaped dark brown spots which may be edged with whitish; usually a large dark Λ-shaped marking on the back of the head; the point of the frontal, and an oblique dark streak behind the eye; labials usually dark-edged; lower parts yellowish white or grey, uniform or the shields edged with black.

Distribution: Gambia, Portuguese and French Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Nigeria, U. of So. Africa, Federation of Rhodesia and Nyasaland, Mozambique, Tanganyika, Kenya, Uganda, Ruanda-Urundi, Somalia, French Somaliland, Ethiopia, Eritrea, Sudan, and Central African Republic, Niger and Chad.

Mamba, Common Mamba, Black Mamba, Green Mamba, South African Mamba, or "Obiya" and "Omeja" (by Lango Natives); (*Dendroaspis angusticeps*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



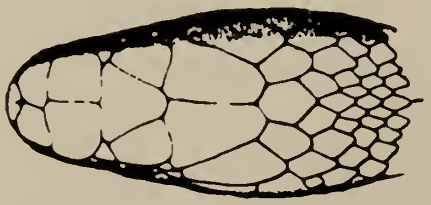
Identifying Characteristics: Dorsal (Back) Scale Rows: 19–25; Ventral (Belly) Plates: 202–270; Subcaudal (Tail) Plates: 97–124; Anal Plates: divided; Temporal (Head) Shields: 2 + 3–4; Pre- and Post-Ocular Shields: 2–3 and 2–3.

Description: Head shields similar to *D. viridis,* but upper temporal much smaller, not longer than the lower, followed by a second, and separated from its fellow on the other side by 5 or more scales or shields; outer row of scales not shorter than dorsals. Extremely advanced forward position of fangs will immediately identify a mamba; incredibly fast, its swiftness in dusty country frequently makes its passage invisible; unreliable and apt to be aggressive; up to 8 feet long; found in low lying bush country not in excess of 2000 feet altitude.

Color: Green, olive or blackish, uniform or some of the scales edged with black; yellowish or pale green beneath; caudal scales and shields not black-edged. Black juveniles unknown; jaw lining jet black.

Distribution: Sudan, Ethiopia, French Somaliland, Somalia, Kenya, Ruanda-Urundi, Tanganyika, eastern portion of Republic of Congo, Uganda, Federation of Rhodesia and Nyasaland, Mozambique, Angola, Union of South Africa; Southwest Africa.

Jameson's Mamba; (*Dendroaspis jamesoni*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



Identifiying Characteristics: Dorsal (Back) Scale Rows: 15–19; Ventral (Belly) Plates: 210–235; Subcaudal (Tail) Plates: 94–122; Anal Plates: divided; Temporal (Head) Shields: 2; Pre- and Post-Ocular Shields: 2–3 and 2–3.

Description: Head shields similar to *D. viridis* but outer row of dorsal scales not longer than the others; length about 2100 mm; tail 560 mm. Maximum length on occasion up to 12 feet; bears a striking resemblance to the boomslang (*D. typus*).

Color: Coloration similar to *D. viridis;* young with chevron-shaped black crossbars; tail sometimes black.

Distribution: Portuguese and French Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Nigeria, Niger, Chad, Congo, Gabon, Republic of Congo, Angola Southwest Africa, Sudan, Central African Republic, Cameroons, French Cameroun.

(*Dendroaspis polylepis antinorii*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 248; Subcaudal (Tail) Plates: 117; Anal Plates: divided; Temporal (Head) Shields: 2 + 3–4; Pre- and Post-Ocular Shields: 2–3 and 2–3.

Description: Head shields similar to *D. viridis* but second upper labial small, not larger than first, and in contact with the posterior nasal only; third upper labial large, forming a short suture with the prefrontal; length 2690 mm; tail 545 mm.

Color: Olive above, yellowish beneath.

Distribution: Ethiopia.

Black, Green or Brown Mamba; (*Dendraspis polylepis polylepis*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–25; Ventral (Belly) Plates: 242–282; Subcaudal (Tail) Plates: 105–127; Anal Plates: divided; Temporal (Head) Shields: 2 + 3–4; Pre- and Post-Ocular Shields: 2–3 and 2–3.

Description: Similar to *D. viridis* in head shield arrangement; however, some authorities consider this species to be a synonym of *D. angusticeps*, from which it differs mainly by the larger number of central plates; length up to about 12 feet.

Color: Dark olive green to brown above, yellowish beneath; inside of mouth bluish grey to black.

Distribution: Ethiopia, French Somaliland, Republic of Somalia, Uganda, Kenya, Mozambique, Federation of Rhodesia and Nyasaland.

Green Tree Mamba; (*Dendroaspis viridis*); Family: *Elapidae;* Fang Group: *Solenoglypha.*

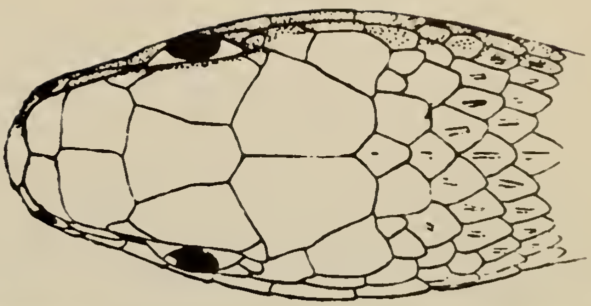
Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates 211–231; Subcaudal (Tail) Plates: 107–121; Anal Plates: divided; Temporal (Head) Shields: 2; Pre- and Post-Ocular Shields: 2–3 and 2–3.

Description: Rostral broader than deep; internasals shorter than the prefrontals; frontal as long as broad or a little broader than long; shorter than its distance from the end of the snout, much shorter than the parietals, in contact with the upper preocular; 2–3 preoculars, with a subocular below them, the latter sometimes fused with the 3rd labial; a subocular below the postoculars; two very large temporals, the upper longest and in contact with the entire outer border of the parietal, the lower usually descending to the lip, between the 6th and 7th labials; the large upper temporal separated from its fellow on the other side by 3 occipital shields; 7–8 upper labials, 4th (or 3rd and 4th) touch the eye, 2nd and 3rd much deeper, usually both but sometimes only the 2nd in contact with the prefrontals; 4 lower labials in contact with the anterior chin shields, which are as long as or shorter than the posterior ones; outer row of dorsal scales much shorter than the others, one dorsal scale corresponding to two laterals or to two ventral plates; length 1830 mm; tail 460 mm.

Color: Olive green above, uniform or each scale brown at the end; head shields finely edged with blackish; lips yellowish, the shields edged with black; belly yellowish, the plates finely edged with brown or black; tail yellow, scales and plates edged with black.

Distribution: Mauritania, Republic of Mali, Senegal, Gambia, Portuguese Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Niger, Chad and Nigeria.

Boomslang; (*Dispholidus typus*); Family: *Colubridae;* Fang Group: *Opisthoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 164–201; Subcaudal (Tail) Plates: 91–131 (paired); Anal Plates: divided; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 (rarely 2) and 3.

Description: Snout short, not much longer than the eye; rostral nearly as deep as broad, visible from above; internasals much shorter than the prefrontals; frontal once and ¼ to 1 and ½ as long as broad, as long as or a little longer than its distance from the end of the snout, as long as the parietals; loreal as long as deep or longer than deep; preocular not reaching the frontal; 7–8 upper labials, 3rd and 4th or 4th and 5th entering or touching the eye; 3–4 lower labials in contact with the anterior chin shields, which are smaller than the posterior ones; eyes exceptionally large and round, scales keeled; swells neck when patience is exhausted; tail long; loreal scale rough, triangular; maximum length about 1775 mm; tail 400 mm or more.

Color: Coloration very variable; at least 6 color types recognized as follows:

(1) Brown above, upper lip and lower parts yellowish or greyish; young with darker and lighter spots, and the belly speckled with brown.

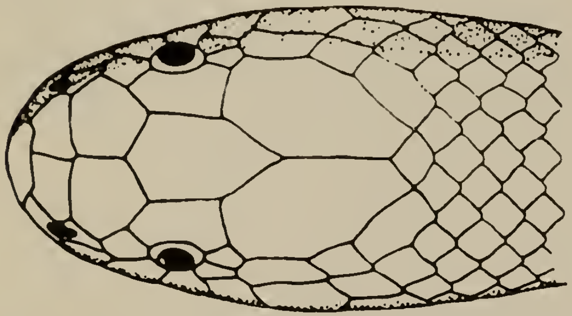
(2) Olive brown above, yellowish beneath, scales and shields edged in black.

(3) Green above, uniform or scales narrowly edged with black.

(4) Green or olive above, all the scales and shields edged with black; head often much spotted with black.
(5) Black above, each scale with a yellowish or greenish spot; head spotted or marked with black; ventrals and subcaudals yellowish, edged with black.
(6) Uniform black above, blackish grey beneath.

Distribution: Mauritania, Gambia, Senegal, Republic of Mali, Portuguese and French Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Niger, Chad, Upper Volta, Central African Republic, Republic of Congo, Gabon, Congo, French Cameroun, Cameroons, Nigeria, Angola, Southwest Africa, Union of South Africa, Mozambique, Zanzibar (pure black form), Tanganyika, Kenya, Ruanda-Urundi, Uganda, Ethiopia, Republic of Somalia, French Somaliland, Eritrea, Sudan, Federation of Rhodesia and Nyasaland.

Guenther's Cobra, Black Water Snake, African Garter Snake; (*Elapsoidea guentheri*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



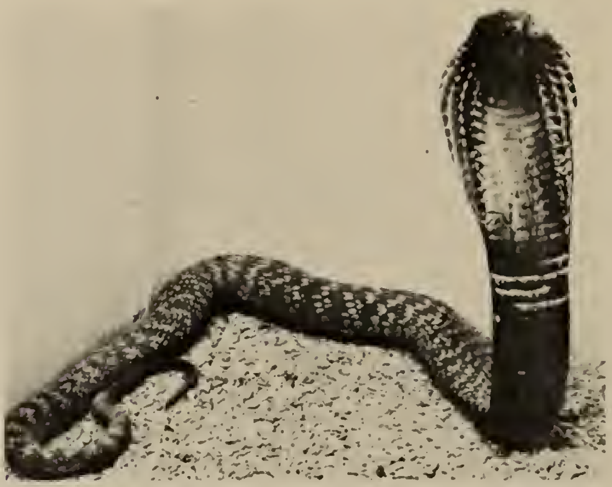
Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 138–168; Subcaudal (Tail) Plates: 13–29; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Snout rounded; rostral broader than deep, the portion visible from above measuring about ⅓ its distance from the frontal; internasals much shorter than the prefrontals; frontal 1½ times as long as broad, as long as or longer than its distance from the end of the snout, a little shorter than the parietals: posterior nasal in contact with, or narrowly separated from the single preocular; 7 upper labials, 3rd and 4th touching the eye, 6th largest; 3–4 lower labials in contact with the anterior chin shields, which are separated from the mental; posterior chin shields nearly as large as the anterior ones; nostril between 2 nasal shields; easily mistaken for *Atractaspis* species; inclined to burrow; tail very short; length 520 mm; tail 50 mm; subcaudals all or most in pairs.

Color: Whitish or grey above, with black, white-edged cross-bands, or blackish with whitish crossbars or lines formed by the edges of some of the scales; lower parts dirty white or brownish, grey, or blackish.

Distribution: Nigeria, Cameroons, French Cameroun, Gabon, Republic of Congo, Chad, Central African Republic, Congo, Uganda, Ruanda-Urundi, Tanganyika and Kenya.

Ringhals "Spitting Cobra"; (*Hemachatus haemachates*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 19; Ventral (Belly) Plates: 116–150; Subcaudal (Tail) Plates: 33–44; Anal Plates: entire; Temporal (Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 1 and 3.

Description: Snout prominent, obtusely pointed; rostral nearly as deep as broad, its upper portion nearly as long as its distance from the frontal; internasals longer than the prefrontals; frontal 1½ times to 1¾ times as long as broad, shorter than its distance from the end of the snout, as long as or a little shorter than the parietals; one preocular in contact with the internasal and the posterior nasal; lower anterior temporal very large; 7 upper labials, 3rd deepest, 3rd and 4th touching eye; 4 lower labials in contact with the anterior chin shields, which are longer than the posterior; length up to 6 feet, average about 3 to 4 feet; not a true cobra but has adapted the defensive posture of the cobras.

Color: Black above, spotted, variegated, or irregularly barred with yellowish-white or pale brown, or brown spotted with black; black beneath, often with one or two whitish cross-bands on the neck (from which its name "ringhals" is derived).

Distribution: Mozambique, Federation of Rhodesia, and Nyasaland, Union of South Africa, and Southwest Africa.

Anchieta's Cobra; (*Naja anchietae*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15–17; Ventral (Belly) Plates: 181–192; Subcaudal (Tail) Plates: 52–62; Anal Plates: entire; Temporal

(Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye moderate, about half the length of the snout; rostral as deep as broad, its upper portion forming an acute angle wedged in between the internasals and measuring nearly its distance from the frontal; internasals shorter than the prefrontals; frontal once and a half as long as broad, shorter than its distance from the end of the snout, half as long as the parietals; 7 upper labials, 6th largest and in contact with the lower postocular; 4 lower labials in contact with the anterior chin shields, which are longer than the posterior ones; neck non-dilatable; length 1800 mm; tail 340 mm.

Color: Brown to blackish above; end of snout and sides of head yellow; yellow or pale brownish beneath, with or without brown spots and with a brown or black crossband under the neck.

Distribution: Angola, Southwest Africa, Federation of Rhodesia and Nyasaland, Union of South Africa.

Cape Cobra; (*Naja flava*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 200–227; Subcaudal (Tail) Plates: 50–67; Anal Plates: entire; Temporal (Head) Shields: 1–2 + 2–3; Pre- and Post-Ocular Shields: 1 and 3 (one of which may be considered a subocular).

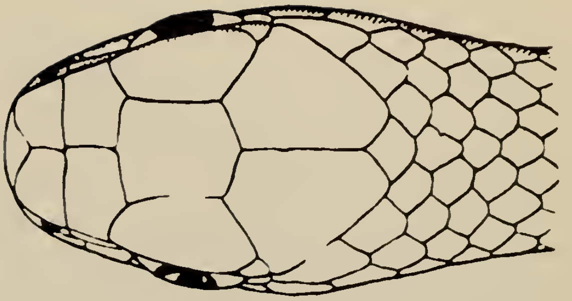
Description: Eye moderate, ⅖ to ½ the length of the snout; rostral as deep as broad, its upper portion measuring ½ to ⅔ its distance from the frontal; internasals as long as the prefrontals; frontal as long as broad to once and ⅔ as long as broad, as broad as the supraocular, shorter than its distance from the end of the snout, ⅗ to ⅔ the length of the parietals; 7 upper labials, 3rd and 4th touching the eye, 6th largest and in contact with the lower postoculars; 4 lower labials in contact with the anterior chin shields; posterior chin shields nearly as long as but narrower than the anterior, and separated from each other by scales; 23 rows of dorsal scales on neck; length 1470 mm; tail 230 mm.

Color: Coloration very variable, yellowish, reddish, or brown to black, uniform or with lighter and darker spots; a blackish band sometimes present across the lower surface of the neck.

Distribution: Southwest Africa, Union of South Africa, Federation of Rhodesia and Nyasaland, Mozambique and Tanganyika.

Gold's Cobra, Black Cobra, Black Forest Cobra. Native names same as *N. haje;* (*Naja goldii*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 194–197; Subcaudal (Tail) Plates: 83–92; Anal Plates: entire; Temporal (Head) Shields: 1 + 2–3; Pre- and Post-Ocular Shields: 1–2 and 2.



Description: Has particularly large eye, which differentiates it from *N. melanoleuca* which it superficially resembles, and smaller fangs; largely arboreal but glossy appearance of scales suggests that it is possibly aquatic; nearly hood-less; loreal shield present in most specimens; inclined to bite from a short rush rather than strike; not known to spit; rostral broader than deep, the portion visible from above ⅓ to ½ as long as its distance from the frontal; internasals as long as the prefrontals, not reaching the preocular; frontal 1 and ½ times as long as the parietals; 1, 2, or 3 suboculars; 7 upper labials, 4th or 3rd and 4th touching the eye; 6th largest and in contact with the lower suboculars; 4 lower labials in contact with the anterior chin shields which are as long as or a little longer than the posterior ones; maximum length 2565 mm; nostril large opening posteriorly, internasal bordering the nostril; astonishingly quick and highly dangerous.

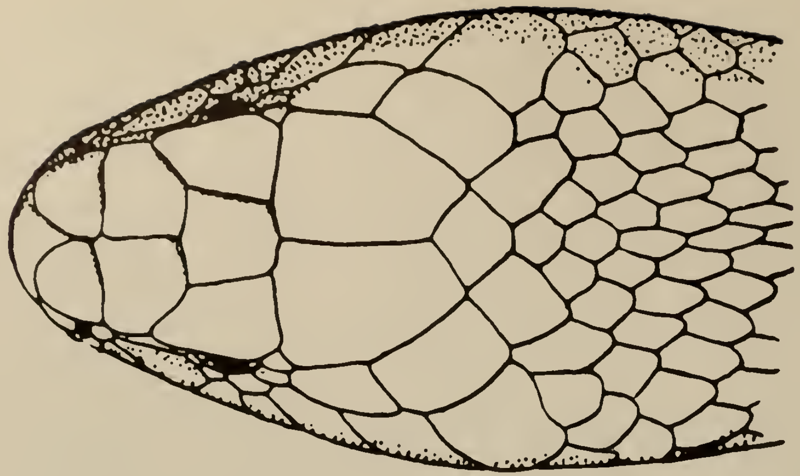
Color: Black above, uniform or with transverse series of small whitish spots; sides of head and end of snout white, with most of the sutures between the shields black; ventrals white, with a black edge, which becomes gradually broader until on the posterior fourth of the body the shields are entirely black; subcaudals black.

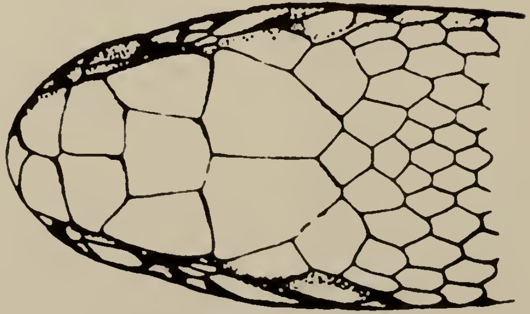
Distribution: Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Nigeria, Cameroons, French Cameroun, Niger, Chad, Congo, Gabon, Republic of Congo, Central African Republic, Upper Volta.

Egyptian Cobra, Brown or Black Cobra, Banded or Rock Cobra. *Native names:* "Nchuweira" "Nsuweira", "Nsuweila" (Bagando Tribe); "Mpiri" "Mpili" (Bunyoro Tribe in the Lake Albert region). (*Naja haje*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates; 191–221; Subcaudal (Tail) Plates: 51–74; Anal Plates: entire; Temporal (Head) Shields: 1 + 2–3; Pre- and Post-Ocular Shields: 1 and 2–3.

Description: 21–23 scale rows across neck, subcaudals paired; eye moderate, ⅖ to ½ times the length of the snout; rostral as deep as broad or slightly broader than deep, its upper portion measuring ½ to ⅔ its distance from the frontal; internasals as long as the





prefrontals; frontal once and ⅕ to 1 and ½ as long as broad, as broad as the supraocular, shorter than its distance from the end of the snout, ½ to ⅖ the length of the parietals; one or several more or less enlarged occipital shields behind the parietals; preocular not in contact with the internasal; 2–3 suboculars, separating the eye from the labials; 7 (rarely 8) upper labials, 3rd deeper than 4th, 6th (or 7th) largest and in contact with the anterior chin shields nearly as long as but narrower than the anterior, and separated from each other by scales; inquisitive and insolent; no appreciable neck, eyes round, scales smooth, laterals arranged obliquely, tail short; vertebral scales not enlarged; internasal shield bordering nostril; prefers hot dry localities where water is not scarce; sometimes enters houses; cobras once disturbed, will continue to attack if not at first successful; some loss of venom occurs at each attempt; length up to 12 feet, average specimen about 6 feet.

Color: Yellowish or olive to dark brown or black above, uniform or with darker or lighter spots; lower parts yellowish, with a brown or black band on the neck, or dark brown to blackish; head sometimes blackish.

Distribution: All countries of Africa (except the sterile desert) although it is rare in West Africa and southeast Africa; found also sparingly in southern Palestine and southern Arabia.

Black-lipped Cobra, Black and White Cobra, Black Cobra; (*Naja melanoleuca*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17–21; Ventral (Belly) Plates: 198–226; Subcaudal (Tail) Plates: 58–72; Anal Plates; entire; Temporal (Head) Shields: 1 + 2–3; Pre- and Post-Ocular Shields: 1 and 2–3.

Description: 23–29 scale rows on neck; ventrals usually 207–218; subcaudals usually 61–68 pairs; labials outlined in black; eye moderate, ⅖ to ½ times as the length of the snout; rostral 1 and ⅓ to 1 and ½ times as broad as deep, its upper portion measuring ¼ to ⅓ its distance from the frontal; internasals shorter than the prefrontals; frontal as long as broad or a little longer than broad, as broad as the supraocular, not longer than its distance from the rostral, ½ to ⅗ the length of the parietals; preocular rarely in contact with the internasal; 7 upper labials, 3rd and 4th touching the eye, 6th largest and in contact with the lower postoculars; 3–4 lower labials in contact with the anterior chin shields; posterior chin shields as long as or a little shorter than the anterior, and in contact with each other anteriorly; pupil round; scales smooth; laterials arranged obliquely; vertebrals not enlarged; head slightly broader than neck; internasal bordering the nostril; length up to 12 feet, average specimen 6–8 feet; tail about 400 mm.

Color: Coloration variable; sides of head yellowish or whitish, 5 color forms recognized:

(1) Black, with a lighter angular marking or ring on the hood; anterior ventral region with yellowish crossbars alternating with black ones.

(2) Same as (1) but with white dots or edges to the dorsal scales; the white may be disposed in crossbars.

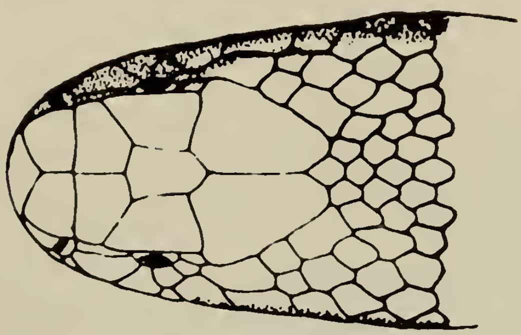
(3) Uniform black (sides and under surface of head excepted).

(4) Anterior half of body pale brown above and white beneath, with blackish annuali, which are broader on the back; posterior part of body and tail black.

(5) Brown above, with small plack spots; uniform yellowish beneath.

Distribution: Sudan, Portuguese and French Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Dahomey, Nigeria, Congo, Gabon, Republic of Congo, Angola, Federation of Rhodesia and Nyasaland, Mozambique, Tanganyika, Kenya, Uganda, Somalia, Ethiopia, Upper Volta, Central African Republic, Niger, Chad, Senegal Gambia, Ruanda-Urundi, Eritrea, French Somaliland, Angola, Union of South Africa.

Spitting Cobra, "M'fesi", Black-necked Cobra; (*Naja nigricollis*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 17–27; Ventral (Belly) Plates: 177–228; Subcaudal (Tail) Plates: 50–68; Anal Plates: entire; Temporal (Head) Shields: 2–3 + 4–5; Pre- and Post-Ocular Shields: 2 (rarely 1) and 3.

Description: Eye moderate, ⅔ to ½ the length of the snout in the adult; rostral 1 and ½ as broad as deep, the portion visible from above measuring ⅓ to ½ its distance from the frontal; internasals as long as or shorter than the prefrontals, in contact with or narrowly separated from the preocular; frontal 1 and ⅕ to twice as long as broad, as broad as or narrower than the supraocular, as long as or shorter than the parietals; 6 (rarely 7) upper labials, 3rd or 3rd and 4th deepest and touching the eye, the last one longest; 4 lower labials in contact with the anterior chin shields; posterior chin shields narrow, as long as or longer than the anterior, and widely separated from each other; 19–29 scale rows across the neck; scales smooth; laterals arranged obliquely; vertebrals not enlarged; head broad, slightly wider than neck; length up to 7 feet, 8 inches, but average specimen about 2000 mm; tail 300 mm.

Color: Variable, three color forms recognized:

(1) Brown or olive above, some or all of the scales black-edged, the skin between the scales black; yellowish beneath, the ventrals speckled or edged with brown or blackish; lower surface of neck with black crossbars.

(2) Uniform brown above, yellowish beneath; lower surface of neck brown in the adult; young with a broad black ring round the neck.

(3) Dark olive to black above; lower surface of head and neck black; subcaudals and posterior ventrals black, the remainder black and yellow.

Distribution: All countries of Africa *except:* Spanish Sahara, Mauritania, French Sudan, Libya, Tunisia, Algeria and Morocco.

Vine Snake, Bird Snake, Twig Snake; (*Thelotornis kirtlandi*); Family: *Columbridae;* Fang Group: *Opisthoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19; Ventral (Belly) Plates: 143–189; Subcaudal (Tail) Plates: 116–170; Anal Plates: divided; Temporal (Head) Shields: 1 + 2 (rarely 1 + 1); Pre- and Post-Ocular Shields: 1 and 3.

Description: Extremely specialized to aboreal habitat; a forest species which has spread to the savannah and is also common on the ground; swells throat conspicuously when irritated; nasal, loreal(s), preocular and the large eye all lie in a depression; eye has a large horizontal pupil; dorsal scales feebly keeled along the vertebral line; subcaudals paired; 3 occipital shields (middle one small); may be 1, 2, or 3 loreal shields; 8 or 9 upper labials, 4th and 5th touching the eye; 9–12 lower labials, 4 or 5 of which are in contact with the anterior chin shields; length 1180 mm; tail 400 mm.

Color: Eyes greyish-brown; light green, greyish or pinkish brown above, uniform or with more or less distinct darker and lighter spots and crossbands; head green above, with or without some patches of pinkish speckled with black and a pinkish black-dotted streak on each side of head passing through the eyes; greyish or pinkish below, speckled with brown.

Distribution: Togo, Upper Volta, Dahomey, Nigeria, Chad, Central African Republic, Cameroons, French Cameroun, Gabon, Republic of Congo, Congo, Ruanda-Urundi, Uganda, Kenya, Tanganyika, Mozambique, Federation of Rhodesia and Nyasaland, Union of South Africa.

Atlas Adder; (*Vipera lebetina mauritanica*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: Up to 27; Ventral (Belly) Plates: 156–178; Subcaudal (Tail) Plates: 38–51; Anal Plates: single.

Description: Scales on the head small, irregular, keeled, overlapping; at forward edge of eye in about 7, at posterior edge 10–12 rows; lower part of ocular ring consisting of three rows of scales; dorsal scales keeled, lower(outer)most row almost smooth; in general form and squamation, the Atlas adder agrees with the type species, *V.l. lebetina*, but is more similar in color and pattern to the mountain adder (*V.l. xanthina*). It is distinguished from the latter especially by the very much more considerable size, in which it probably exceeds all other except *deserti*, the squamation, the little-raised canthus, and the smaller rostral, the 3 (not 2) rows of scales under the eye and the very much darker pattern and less yellow ground color. For difference from *deserti* see latter. Length up to 1600 mm.

Distribution: The Atlas adder occurs everywhere in suitable terrain in the Atlas region, but appears to be restricted to the region of the northern chain and not to go up into the Sahara Atlas mountains. In the west it extends almost to the Atlantic. It is everywhere restricted to the greater heights and extends eastward to the vicinity of Tunis. In lower ground and the Sahara proper, it is replaced by *deserti.* Morocco, Algeria, Tunisia.

(*Vipera superciliaris*) ; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 27; Ventral (Belly) Plates: 142; Subcaudal (Tail) Plates: 40; Anal Plates: entire.

Description: Snout rounded, with distinct canthus; vertical diameter of the eye a little shorter than its distance from the mouth; rostral broader than deep; head covered with small, imbricate, keeled scales; a large supraocular shield; 12 scales around the eye, which is separated from the labials by two series of scales; nostril very large, between 2 nasals, the anterior of which is in contact with the rostral; temporal scales keeled; 9 upper labials; dorsal scales strongly keeled, outer row feebly keeled; length 570 mm; tail 77 mm.

Color: Pale reddish brown or orange above, with blackish crossbars broken by an interrupted yellowish longitudinal streak on each side; head with blackish symmertical markings; whitish beneath, spotted with blackish.

Distribution: Confined to coast of Mozambique.

4. Snakes of Europe, Near and Middle East

1. Atractaspis engaddensis
2. Echis carinatus
3. Echis coloratus
4. Naja morgani
5. Pseudocerastes fieldii
6. Pesudocerastes persicus
7. Vipera ammodytes ammodytes
8. Vipera ammodytes hugyi
9. Vipera ammodytes latastei
10. Vipera ammodytes meridionalis
11. Vipera ammodytes transcauscasiana
12. Vipera aspis
13. Vipera berus berus
14. Vipera berus bosniensis
15. Vipera berus seoanei
16. Vipera lebetina deserti
17. Vipera lebetina euphratica
18. Vipera lebetina lebetina
19. Vipera lebetina raddei
20. Vipera ursinii kaznakovi
21. Vipera ursinii macrops
22. Vipera ursinii renardi
23. Vipera ursinii ursinii
24. Vipera xanthina palaestinae
25. Walterinnesia aegyptia

Burrowing Viper; (*Atractaspis engaddensis*) ; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 27; Ventral (Belly) Plates: 264–277; Subcaudal (Tail) Plates: 36–39; Pre- and Post-Ocular Shields: 1 post.

Description: Head covered with large plates; eyes small with round pupils; one supraocular, one postocular plate; 7 upper labials of which the 4th is the largest; the last one is scale-like; 3rd and 4th upper labials touching the eye; nostrils between two incompletely divided nasals; dorsal scales smooth; subcaudals single; tail ends with a pointed scale at the tip. It has enormously over-developed fangs.

Color: Color dark brown, blackish in life, with a bluish iridescence in some places underside lighter brown.

Distribution: Arabia, Israel, Jordan (Dead Sea Area).

Saw-scaled Viper; "Phoorsa" (India) (*Echis carinatus*) ; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 27–37; Ventral (Belly) Plates: 132–192; Subcaudal (Tail) Plates: 21–48; Anal Plates: entire.

Description: Snout short, rounded when seen from above and in profile; eye large, its diameter greater than its distance from the mouth; nasal more or less completely divided into a large anterior and small posterior portion, the nostril being perforated just in front of the suture; a pair of internasals in contact with one another, usually distinct; scales on the top of the head small, elongate, imbricate, strongly keeled, 8–12 on a line between the supraoculars, which are very narrow and often broken up; 10–15 small scales around the eye exclusive of the superocular; 3–4 scales between the nasal and the eye; temporal scales small, keeled, except the lowermost row; 10–12 upper labials, 4th usually the largest; 1–2 series of scales between the eye and upper labials; anterior chin shields largest followed by 2–3 pairs of smaller shields; outer two rows of keeled and serrated scales largest and an oblique series occurs in the outer 4–5 rows; length 720 mm; tail 70 mm.

Color: Pale buff, greyish, reddish, or brown above, with 1–3 series of whitish dark-edged spots, the outer sometimes forming ocelli; a zigzag dark and light band may run along each side; a cruciform ⅄ -, Ψ-, or Y-shaped whitish marking often present on the head; lower parts whitish, uniform, or with brown dots, or with small round black spots.

Distribution: *Africa;* Egypt, Libya, Tunisia, Algeria, Morocco, Mauritania, Senegal, Gambia, Portuguese Guinea, French Guinea, Sierra Leone, Ivory Coast, Ghana, Liberia, Togo, Nigeria, Cameroons, Ethiopia, French Somaliland, Niger, Chad, Central African Repub., Dahomey, Fr. Cameroun, Sudan, Somalia, Eritrea, Kenya, Upper Volta. *Near and Middle East;* Lebanon, Jordan, Syria, Iraq, Iran, Saudi Arabia, Afghanistan, Pakistan, India, Ceylon.

(*Echis coloratus*) ; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 31–35; Ventral (Belly) Plates: 174–205; Subcaudal (Tail) Plates: 42–52; Anal Plates: entire.

Description: Scales on the snout and vertex convex, smooth or obtusely keeled, 13–15 across from eye to eye; no supraocular shield; 17–22 scales around the eye; 3–4 series of scales between the eye and the labials; nostril in a single or divided nasal, which is separated from the rostral by a series of scales: 12–15 upper labials; length 750 mm; tail 80 mm.

Color: Similar to *E. carinatus* except there is no cruciform light marking of the head.

Distribution: Palestine, Arabia, Socotra Islands, Egypt, Libya, Tunisia, Algeria, Morocco.

Hoodless Cobra, Morgan's cobra; (*Naja morgani*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 180–197; Subcaudal (Tail) Plates: 41–47; Anal Plates: single or divided.

Description: Head not differentiated from neck; eyes small, pupils round; 7 upper labials, 3rd and 4th touch eye and 3rd also touches the nasal scale; several anterior subcaudals are single, rest paired.

Color: Uniform color from jet black to pale brown or brownish purple.

Distribution: Iran, Iraq, Lebanon, Syria, Saudi Arabia.

N.B.—This snake is the only uniformly black or brown snake throughout its distribution and may be identical to *Walterinnesia aegyptia.*

(*Pseudocerastes fieldii*) ; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17–25 keeled; Ventral (Belly) Plates: 134; Subcaudal (Tail) Plates: 35 paired.

Description: Length up to 75 cm. of which 8 cm. is tail: head broadly triangular, covered with small tuberculated scales; eyes surrounded by 15–18 scales, with vertically slit (elliptical) pupils; above each eye a broad pointed, scale covered projection, directed outwards and backwards; 2 rows of scales between eye and upperlabials; 10 rows of scales between eyes; 13 upper labials; dorsal body scales strongly keeled, keels shorter than scales and swollen posteriorly; lateral rows nearly smooth.

Color: Pale yellowish grey with indistinct darker transverse bars on the back and a row of smaller dark spots at the sides; venter (anal) light yellowish grey. Side of head darker behind eye; tip of tail black.

Distribution: This snake lives in rocky desert and has been found in Sihai, Transjordan (Bair Wells, Wadi Deba'ah) and the Southern Negev Desert (Wadi Raman). Nothing is known about its biology and the effects of its bite, except that it is poisonous.

(*Pseudocerastes persicus*) ; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23–25; Ventral (Belly) Plates: 145–158; Subcaudal (Tail) Plates: 34–49; Anal Plates: entire.

Description: Head depressed, snout short and broadly rounded; diameter of eye less than its distance from the mouth; nostril very large, pierced in a large circular or crescentic nasal, bounded above by a supranasal which may be broken up; 2 scales between the nasal and the rostral; scales on the top of the head small imbricate, smooth on the snout, keeled behind in the young, tuberculate and more strongly keeled in the adult; and erect horn-like scale above the eye surrounded by small scales; 9–12 scales on a line between the horns; 16–20 scales around the eye; 3–4 scales on a line between the eye and the nasal; temporal scales small, keeled; 13–14 upper labials, 4 series of scales between them and the eye: 1st pair of lower labials larger than the others; a pair of large anterior chin shields (genials); dorsal scales striated and strongly keeled, the outermost scales markedly over-lapping the ventral scales; subcaudals paired; length 890 mm; tail 110 mm.

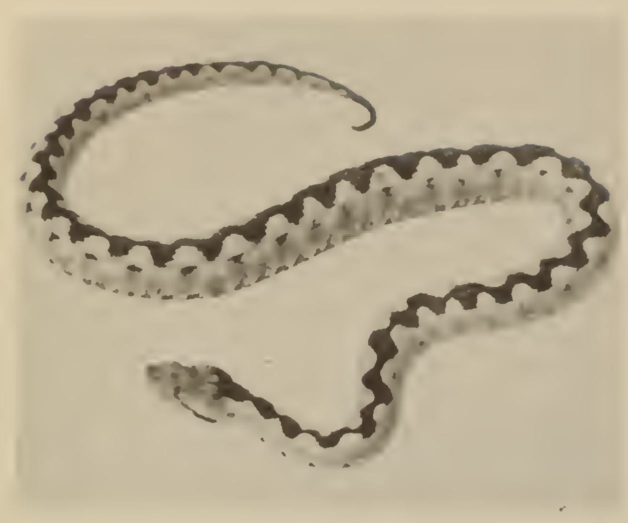
Color: Greyish-brown above, with squarish, dark brown, black-edged spots, which alternate with one another on either side of the vertebral line, or are confluent to form crossbars; sides of the body with rounded, less distinct spots; top of the head pale grey, upper lip and side of the head darker, the two colors meeting in a sharply defined line which extends from the eye to angle of the mouth; whitish beneath, spotted with brown; markings are much less distinct in adults and may be almost entirely absent.

Distribution: Iran and Baluchistan (up to 5000 feet).

Western Sand Adder; (*Vipera ammodytes ammodytes*) ; Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 133–162; Subcaudal (Tail) Plates: 24–38; Anal Plates: entire.

Description: Snout has an erect, oblique horn-like dermal appendage covered with 10–20 small scales; canthus rostralis strong; vertical diameter of eye less than its distance from the mouth in the adult; rostral as deep as broad or broader than deep; head covered with small smooth or faintly keeled scales, among which an enlarged frontal or a frontal and a pair of parietals are sometimes distinguishable; 5–7 longitudinal series of scales between the supraoculars; latter large, usually not extending posteriorly beyond the vertical of the posterior border of the eye; 10–13 scales around the eye; 2 series of scales between the eye and the labial; nasal entire, separated from the rostral by a naso-rostral; temporal scales smooth or faintly keeled; 8–12 upper labials, usually 9–10; 4 or 5 lower labials in contact with the chin shields; length 550 mm; tail 80 mm.



Color: Grey, brown, or reddish above, with an undulous or zigzag black or dark brown, usually black-edged dorsal band; a lateral series of dark spots present or absent; head with or without symmetrical markings above; a dark streak behind the eye usually present; belly greyish or pink, powdered with black with or without black and white spots; end of tail yellow, orange, or coral red; males usually have darker markings.

Distribution: Italy, Yugoslavia, Northern Albania, and adjacent portions of Rumania.

Hugy's Viper; (*Vipera ammodytes hugyi*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 134–169; Subcaudal (Tail) Plates: 30–49; Anal Plates: single.

Description: Snout rather more strongly upturned than in *V.a. aspis;* rostral about one and a half times as high as wide and distinctly raised above the edge of the canthus; ocular ring always double; head with shields present only occurs rarely and then in the young; usually has small keeled scales on the head; horn appears much like that of *V.a. latastei.* Very similar in squamation and habitus to *V. aspis* but distinguished therefrom by the horn rudiment and pattern. Size same as *V. aspis.*

Color: Color pattern clearly intermediate between *V. aspis* and *V.a. latastei.* It is distinguished from *V.a. latastei* by the light, more yellowish, not grey or grey-brown, ground color, the lighter tail tip, the low horn, and the pattern, which in *latastei* is typically a zigzag band.

Distribution: Italy and Sicily.

N.B.—*Viperia aspis hugyi* is a synonym for this species.

Snub-nosed Adder; (*Vipera ammodytes latastei*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21; Ventral (Belly) Plates: 125–147; Subcaudal (Tail) Plates: 32–43; Anal Plates: single.

Description: Snout sometimes merely turned up as in *V. aspis*, sometimes ending in a dermal appendage or horn which is but little less developed than in the type species, *V.a. ammodytes;* rostral once and a half to twice as deep as broad, nearly reaching the tip of the rostral wart; 5 or 6 (rarely 3) scales on the posterior aspect of the latter (wart); head covered with small, smooth, or feebly keeled, subimbricate scales, among which a slightly enlarged frontal may sometimes be distinguished; 5–7 longitudinal series of scales between the supraoculars, which are well developed; 9–13 scales around the eye, usually 10–12; 2–3 series of scales between the eye and the labials; nasal entire, separated from the rostral by a nasorostral; temporal scales smooth or feebly keeled; 9–11 upper labials; 4–5 lower labials in contact with the chin shields; dorsal scales strongly keeled, outer row smooth or feebly keeled; length 500–690 mm.

Color: Grey or brown above, with a dark brown, usually black-edged undulous or zigzag band along the spine and a lateral series of spots; head with or without small dark markings above, and a dark streak behind the eye; labials more or less speckled or spotted with black; lower parts grey, spotted with black and white, or blackish speckled with white; end of tail usually yellow or with yellow spots.

Distribution: Spain, Portugal, Morocco; Tunisia and Algeria north of the Atlas Mtns.

N.B.—Scarcely reaches the size of *V. aspis* and always smaller than *V.a. ammodytes.*

Eastern Sand Adder; (*Vipera ammodytes meridionalis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 133–162; Subcaudal (Tail) Plates: 24–38; Anal Plates: single.

Description: Dorsal scales strongly keeled, belly weakly so; length 450–760 mm.

Color: Similar to type species.

Distribution: On the southern side of the Danube River from the Jantra River in North Bulgaria to the mouth; the entire southern part of the Balkan Peninsula, southern Bulgaria, and Thrace. In the Aegean Archipelago on Euboea, Andros, Delos, Siphnos, Syra, Ios and Tinos, Mykonos, and Xaxos. Known in Asia Minor from the Asiatic shore of the Bosporus, Cilicia, and Lebanon. Albania, Yugoslavia, Greece, Turkey, Syria, Lebanon, Rumania, Bulgaria.

N.B.—*V.a. montandoni* is a synonym of this snake.

Armenian Sand Viper; (*Vipera ammodytes transcaucasiana*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 133–162; Subcaudal (Tail) Plates: 24–38; Anal Plates: single.

Description Dorsal scales strongly keeled, belly weakly so.

Color: Similar to type species.

Distribution: Limited to the region of the Kura River and its tributaries; evidently does not enter the plain, but keeps to the hill country and middle elevations of the slopes of the Caucasus and The Transcaucasian Mountains. It ascends the valley of the Kura westward, but does not cross the divide between the Kura and the Rion River. Whether and to what extent it occurs in Armenia is unknown (USSR and Iran).

European Asp, Aspisviper Juraviper (*Vipera aspis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

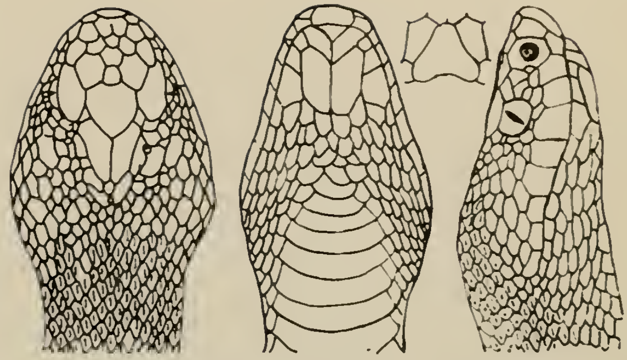
Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23 (rarely 19 or 25); Ventral (Belly) Plates: 134–169; Subcaudal (Tail) Plates: 30–49; Anal Plates: single.

Description: Snout flat above, more or less distinctly turned up at the end, with sharp, not or but very feebly raised canthus; vertical diameter of the eye nearly equal to its distance from the mouth; supraocular region more or less slanting forwards, the posterior border of the supraocular usually not extending beyond the vertical of the posterior border of the eye; rostral usually deeper than broad, its width $\frac{4}{5}$ to $\frac{2}{3}$ its depth, extending to the upper edge of the snout; 2–3 apical shields; upper surface of head usually covered with small, subimbricate, smooth or feebly keeled scales, in 4–7 series between the supraoculars; frontal and parietal shields usually absent, sometimes distinct, but small and rather irregular, the former separated from the supraoculars by 2 series of scales; supraocular well developed; 8–13 scales around the eye, usually 10–12; two (rarely 3) series of scales between the eye and the labials; nasal single, separated from the rostral by a naso-rostral; temporal scales smooth or feebly keeled; 9–13 upper labials, usually 9–11; 4 (rarely 5) lower labials in contact with chin shields; dorsal scales strongly keeled, outer row more or less distinctly keeled, rarely perfectly smooth; length 675 mm; tail 95 mm.

Color: Coloration very variable; grey, yellowish, brown, or red above, with dark markings in the form of paired spots or crossbars, or with a zigzag band as in *V. berus;* usually a)(-shaped dark marking on the back of the head and a dark streak behind the eye; upper lip whitish, yellowish, or pinkish, with or without dark vertical bars on the sutures between the labials; yellowish, whitish grey, or black beneath, with or without darker and lighter markings; some specimens entirely black.

Distribution: France, Italy, Sicily, Switzerland, Germany and Spain.

Common European Viper, Common Cross *Adder, "Kreuzotter";* (*Vipera berus berus*); Family: *Viperidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 19–23 (21); Ventral (Belly) Plates: 132–158; Subcaudal (Tail) Plates: 24–46; Anal Plates: entire; Pre- and Post-Ocular Shields: at least 2 preoculars.

Description: Snout broadly rounded or truncate, with strong canthus which is very slightly raised; eye usually larger in males, its vertical diameter equal to or greater than its distance from mouth; rostral as deep as broad, or slightly broader than deep, in contact with 2 apical shields (rarely with 1); frontal and parietal usually distinct; supraoculars well developed, sometimes in contact with the frontal, usually separated from it by a series of 2–4 scales; 6–13 scales around the eye, usually 8 to 10; the upper preocular only exceptionally in contact with the nasal; 1, rarely two, series of scales between the eye and the labials; nasal single, not or but slightly larger than the eye, separated from the rostral by a naso-rostral; temporal scales smooth, rarely feebly keeled; 6–10 upper labials, usually 8 or 9; 3–4 (rarely 5) lower labials in contact with the chin shields; length 660 mm; tail 90 mm.

Color: Coloration very variable; grey, yellowish, olive, brown, or red above, usually with a dark undulating or zigzag band along the spine and a series of lateral spots; a Λ -, >< -, or)(-shaped dark marking on the back of the head and a dark postocular streak; upper labials whitish or yellowish, the anterior at least edged with brown or black; grey to brown or black beneath, uniform or spotted with darker or lighter; end of tail usually yellow or coral red; some specimens entirely black, either through darkening of the ground color (females) or through extension of black markings (males); males usually distinguishable from females by darker, deep black markings and lighter ground color.

Distribution: Europe, generally distributed in the North, mostly confined to the mountains in the center, irregularly distributed in the South (northern Spain and Portugal, northern Italy, Bosnia); Caucasus; European Russia, Siberia and Central Asia eastwards to Sakalin Island. Most common where there are dense areas of brush, wasteland briar and hedges; favors moist but not wet ground; not vicious or aggressive but easily frightened into biting.

N.B.—This snake must be differentiated from the common non-poisonous (*Colubridae*) snakes with the same distribution. The characteristics of *V.b. berus* differentiate it from the *Colubridae*: (1) vertical pupil; (2) presence of apical scales; (3) presence of subocular scales and (4) the anal plate is single. It may be differentiated from *V. aspis* by the presence of large head shields (parietals) behind the line of the eyes. *V. ammodytes* antiserum is effective against the bite of this snake.

Balkan Cross Adder; (*Vipera berus bosniensis*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21 (rarely 23); Ventral (Belly) Plates: 132–158; Subcaudal (Tail) Plates: 24–58; Anal Plates: single.

Description: Dorsal scales strongly keeled; length 405–665 mm; tpi of snout somewhat broader than in *V.b. berus*, anteriorly truncate, rows of scales normal; in general, as in *berus*.

Color: Ground color always browner than in *berus;* in specimens in which the dorsal band is broken up into transverse bars, these are usually laterally pointed, not truncate as in *aspis*.

Distribution: Bulgaria, Yugoslavia and northern Albania (middle altitudes only).

Iberian Cross Adder; (*Vipera berus seoanei*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: usually 21; Ventral (Belly) Plates: 132–158; Subcaudal (Tail) Plates: 24–58; Anal Plates: single.

Description: Head short, snout rounded; readily distinguishable from the type species, *V.b. berus*, by the size, color pattern, resolution of the head shields and the short head. In spite of the similar head scales, it cannot be confused with *V. ammodytes aspis*, which is larger, has a different pattern, keeled head scales and a raised, bent-up prolongation of the snout.

Color: Similar in general coloration to *V.b. berus*.

Distribution: Found only in the northern part of Portugal and northwest Spain. Never occurs in the same locality with *V.a. latastei*.

Sahara Adder; (*Vipera lebetina deserti*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–27; Anal Plates: single.

Description: Dorsal scales distinctly keeled; ocular ring in 3 rows; head short and rounded with smooth scales, in posterior part of head at least 12 rows, anteriorly about 8 rows; size about the same as *V.l. mauritanica* which it resembles very closely in having the same general kind of squamation; distinguished from *V.l.* and the types species, *V.l. lebetina*, in having a very short head and numerous keel-less scales on round head and the lightening of the ground color.

Color: Presents a pattern of pale ocelli.

Distribution: Southern Algeria to Southern Libya and very likely occurs further east; lives in flat country and does not go up into the mountains.

(*Vipera lebetina euphratica*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23–27; Ventral (Belly) Plates: 162–179; Subcaudal (Tail) Plates: 40–51.

Description: Subcaudals paired; resembles *V. russelli.*

Color: Grey, brownish, buff above, mottled with darker or with large indistinct dorsal and lateral spots and blotches; lighter below; thickly powdered with grey or brown; dorsal spots arranged in series: 2 lateral and 1 vertebral; length 1340 mm; tail 185 mm.

Distribution: Northwest India to eastern Europe, especially in Iran, and Bakhara.

Levantine Adder; (*Vipera lebetina lebetina*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23–27 (usually 25); Ventral (Belly) Plates: 147–180; Subcaudal (Tail) Plates: 38–58; Anal Plates: entire.

Description: Snout rounded and obtuse or subacuminate, usually with well-marked canthus; vertical diameter of eye shorter than its distance from the mouth in the adult; rostral as deep as broad, a little broader than deep, or slightly deeper than broad, reaching or nearly reaching upper surface of the snout and in contact with two or three apical scales; scales on upper surface of head small, subimbricate feebly or strongly keeled, rarely smooth on the forehead and snout; 7–12 longitudinal series of scales between the eyes (supraoculars included); supraocular well developed or narrow, or broken up into two or more small shields; 12–18 scales round the eye; 2–3 series of scales between the eye and the labials, sometimes only a single scale between the eye and the fourth labial; nostral in a single nasal, which is usually partially fused with the naso-rostral; a well-developed supranasal; temporal scales keeled; 9–12 upper labials; 4–5 lower labials in contact with the chin shields; dorsal scales strongly keeled, outer row smooth or feebly keeled; length 1340 mm; tail 185 mm.

Color: Coloration varying to the same extent as in *V. aspis.* Grey or pale brown above, with a dorsal series of large dark brown spots, often edged with blackish, which may be confluent in to an undulous band, or with small dark spots or crossbars; small dark lateral spots and vertical bars; a large Λ-shaped marking on the upper surface of the head, and a **/\** -shaped one on the occiput, may be present; a dark streak behind the eye to the angle of the mouth, and usually a dark blotch below the eye; whitish beneath, powdered with grey-brown, with or without dark brown spots; end of tail yellow. All markings sometimes very indistinct.

Distribution: Turkey, Iraq, Iran, Syria, Lebanon, Afghanistan, Greece, USSR, Saudi Arabia.

Armenian Mountain Adder; (*Vipera lebetina raddei*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23; Ventral (Belly) Plates: 150–180 Subcaudal (Tail) Plates: 23–32; Anal Plates: entire.

Description: Snout rounded; vertical diameter of eye measuring hardly half its distance from the mouth; rostral somewhat deeper than broad, not extending to the upper surface of the snout; head covered above with small, feebly keeled scales; supraocular undivided, well developed and erectile, the free edge angular, separated from the eye by small scales, the eye being surrounded by a complete circle of 14–17 scales; eye separated from the labials by 2 series of scales; nostril pierced in a single nasal, which is imperfectly separated from the naso-rostral; temporal scales keeled; 9–10 upper labials; dorsal scales strongly keeled, even laterally; anal entire; length 740 mm; tail 50 mm.

Color: Pale brown or greyish above, with a dorsal series of somewhat lighter reddish roundish spots which are dark-edged on the sides; these spots may be in pairs and alternating; sides with two series of dark brown spots; a dark Λ -shaped marking on the back of the head and a dark streak behind the eye; yellowish beneath, powdered with black, each shield with a transverse series of black and white spots.

Distribution: USSR, Turkey and Iran (banks of the Aras and Kura Rivers only).

Caucasus Adder; (*Vipera ursinii kaznakovi*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 130–141; Subcaudal (Tail) Plates: 29–40; Anal Plates: single.

Description: Dorsal scales strongly keeled; in its typical form readily distinguished from the steppe adder, since it is smaller, stouter and much shorter-headed; length 485 mm.

Color: Similar to type species.

Distribution: Very limited range; southern and northwestern slopes of Caucasus, probably to considerable heights; positively known from the southern side of the western Caucasus in the region of the Rion tributaries; from the valley of the Rion extends into the region of the upper Kura and is positively known at Bakuriani in Transcaucasia; also found north of the Caucasus in the southern Kuban region. It is not found in the eastern Caucasus and the lower Kura plain. The easternmost known locality north of the main chain is the valley of the little Laba. Eastern Turkey, Iran, southern Russia.

Karst Adder; (*Vipera ursinii macrops*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: usually 19.

Description: Diameter of eye as great or greater than its distance from mouth; scales between eye and supralabials very narrow; head short; ocular ring always single; apical scale usually single (rarely longitudinally divided); length 350–400 mm.

Color: Ground color grey or yellowish grey; scales of throat and lower labials with black margins; dark dorsal pattern on light background; color somewhat darker than *V.u. ursinii.*

Distribution: Bosnia, Hercegovina, and Montenegro (Yugoslovia); Northern Albania, Greece (probably not beyond the Vardar) and Lulin Mtns. west of Sofia, Bulgaria.

Renard's Viper, Steppe Adder; (*Vipera ursinii renardi*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 130–150; Subcaudal (Tail) Plates: 24–37; Anal Plates: entire; at least 2 preoculars.

Description: Snout pointed, flat above, with raised canthus; eye as in *V. berus;* rostral as deep as broad or a little deeper than broad, just visible from above and in contact with a single apidal shield; distinct frontal and (usually) parietal shields, the former once and ⅔ to once and ⅓ as long as broad, as long as or longer than the parietals; supraocular well developed, separated from the frontal by 1–3 shields; 9–11 shields around eye, the upper preocular usually in contact with the nasal; nostril pierced in the lower half of a single nasal, which is separated from the rostral by a naso-rostral; temporal scales smooth or upper ones faintly keeled; 8–9 upper labials; 4 (rarely 5) lower labials in contact with the chin shields; dorsal scales strongly keeled on the back, smooth or faintly keeled on the outer row; subcaudals in two rows; length 620 mm; tail 75 mm.

Color: Color very similar to *V.u.* ursinii, but darker in general.

Distribution: Bulgaria, Turkey, Iran, Russian Armenia, Turkestan and Central Asia.

N.B.—This snake shows somewhat more tendency to breaking up of the large head shields than in the meadow adder, particularly the frontal. Differs from the meadow adder especially in the pointed head and overall size. The Caucasus adder (*V.u. kaznakovi*) is immediately distinguishable by its smaller size, very short round head, the frequently more vivid color, and the breaking up of the head shields.

Meadow Adder, Ursini's Viper, "Spitzkopfotter" "wiesenotter"; (*Vipera ursinii ursinii*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19; Ventral (Belly) Plates: 120–145; Subcaudal (Tail) Plates: 20–37; Anal Plates: single.

Description: Snout obtusely pointed, flat above or with the canthus slightly raised; eye very small, usually smaller than the nasal shield, its horizontal diameter not exceeding its distance from the posterior border of the nostril, its vertical diameter equal to or less than its distance from the mouth; rostral visible from above, in contact with one, rarely with two apical shields; distinct frontal and parietal shields; frontal nearly always longer than the parietals; superocular well developed, separated from the frontal by one to three shields; 6–10 scales around the eye, usually 8–9, the upper preocular usually in contact with the nasal; a single series of scales between the eye and the labials; nasal single, separated from the rostral by a naso-rostral; temporal scales smooth; 6–9 upper labials, usually 7–8, 3 (rarely 4) lower labials in contact with the chin shields; dorsals strongly keeled on back, less strongly on the sides, outer row smooth; length 500 mm; tail 50 mm.

Color: Yellowish or pale brown above, grey or dark brown on the sides, sometimes uniform brown; a vertebral series of more or less regular, transversely oval, elliptic or rhomboidal dark brown, black-edged spots, some or all of which may be confluent and form an undulous or zigzag band; 2–3 longitudinal series of dark brown or black spots along the sides, the lowermost on the outer row of scales; small dark spots and 1–2)(-shaped markings on the upper surface of the head; an oblique dark stripe from the eye to the angle of the mouth; rostral and labials uniform white, rarely with a few small blackish spots, or with brownish borders; chin and throat yellowish white, rarely with some blackish spots; ventrals and subcaudals black, with transverse series of small white spots, grey, checkered with black and white, or whitish with small round black spots; tail but rarely tipped with yellow.

Distribution: Southeast France, central Italy, Hungary, Yugoslavia, Romania, Bulgaria, and the lower Danube basin.

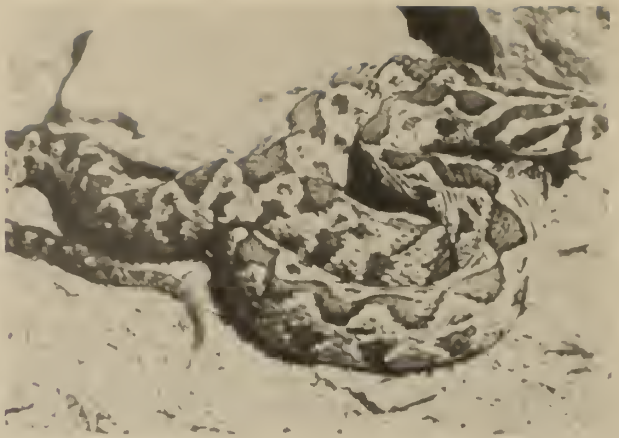
N.B.—Smaller and shorter-headed than *V.u. renardi* and with lighter color; least dangerous of European vipers; not aggressive; use *V. ammodytes* antiserum when necessary.

Palestinian Viper; (*Vipera xanthina palaestinae*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25; Ventral (Belly) Plates: 162–172; Subcaudal (Tail) Plates: 36–44; Anal Plates: single.

Description: Head elongate triangular, distinctly wider posteriorly than the neck; eye with vertical pupil and golden iris; head covered with small keeled scales; supraocular shield large, undivided; 6–8 rows of scales between the supraoculars; subralabials 10–11; 12–13 small shields around the eyes; 2–3 rows of scales between eye and upper labials; subcaudals paired; length up to 1200 mm; tail 160 mm. Very large fangs.

Color: Olive drab to reddish brown; head with a dark spot in form of V pointing forward; a dark spot from eye down to mouth and a dark stripe from the hind edge of the eye to the posterior angle of the mouth; back with dark brown zigzag or wavy band with black edge, which in some places may separate into single square or rhomboid spots; at the sides large vertical blackish spots with lighter centers in the intervals of the dorsal band; underside yellowish with dark marbling in the female, greyish in the male.



Distribution: Turkey, Syria, Israel, Lebanon, Jordan, Palestine.

N.B.—*Vipera lebetina xanthina* is a synonym for this species; main diet is rodents and therefore found in stables and houses hunting rats; also feeds on birds and climbs trees well. It is definitely nocturnal and on the whole moves slowly. Restricted to Mediterranean territory with water and vegetation and is absent in eremic conditions (true desert). If frightened it coils, bends its neck into a horizontal S-shaped curve and watches, moving only its tongue quickly. Its strike is exceedingly quick and reaches to about one half of its body length. It never attacks spontaneously but bites only if trodden upon or touched by accident.

(*Walterinnesia aegyptia*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23 (27 on neck); Ventral (Belly) Plates: 189–197; Subcaudal (Tail) Plates: 45–51; Anal Plates: divided; Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral broader than deep, the portion visible from above half as long as its distance from the frontal; internasals as long as the prefrontals; frontal once and a half as long as broad, as long as its distance from the rostral, ⅔ the length of the parietals; posterior nasal in contact with the single preocular, which is more than two times as long as deep; two postoculars and a subocular; lower anterior temporal very large; 7 upper labials, 3rd and 4th touching the eye, 3rd, 4th and 5th deepest; 4 lower labials in contact with the anterior chin shields, which are longer than the posterior; subcaudals paired except the first 2 to 8 which are single; dorsal scales keeled posteriorly, smooth anteriorly; tail ends in sharp-pointed scale; length 1170 mm; tail 170 mm.

Color: Blackish brown above, paler brown beneath.
Distribution: Egypt, Israel, Jordan, Arabia.
N.B.—Probably identical with *Naja morgani.*

5. Snakes of India, Southeast Asia, The Far East, Australia, and Pacific Islands.

1. Aepysurus eydouxii
2. Acanthophis antarcticus
3. Agkistrodon acutus
4. Agkistrodon halys blomhoffi
5. Agkistrodon himalayanus
6. Agkistrodon hypnale
7. Agkistrodon nepa
8. Agkistrodon rhodostoma
9. Astrotia stokesi
10. Azemiops feae
11. Bungarus bungaroides
12. Bungarus caerulus
13. Bungarus candidus
14. Bungarus ceylonicus
15. Bungarus fasciatus
16. Bungarus flaviceps
17. Bungarus lividus
18. Bungarus multicinctus
19. Bungarus javanicus
20. Callophis gracilis
21. Callophis macclelandi macclellandi
22. Callophis macclellandi formosensis
23. Callophis maculiceps
24. Demansia nuchalis
25. Demansia olivacea
26. Demansia psammophis
27. Demansia textilis
28. Denisonia maculata
29. Denisonia signata
30. Denisonia superba
31. Disteira cyanocincta
32. Disteira ornata
33. Enhydrina schistosa
34. Hemibungarus boettgeri
35. Hemibungarus calligaster
36. Hemibungarus collaris
37. Hemibungarus japanicus
38. Hemibungarus mcclungi
39. Hemibungarus sauteri sauteri
40. Hemibungarus sauteri hatorii
41. Hydrophis cyanocinctus
42. Hydrophis spiralis
43. Kerilia jerdoni
44. Kolpophis annandalei
45. Lapemis curtus
46. Lapemis hardwickii
47. Laticauda colubrina
48. Laticauda laticaudata
49. Laticauda semifasciatus
50. Maticora bivirgata
51. Maticora intestinalis
52. Microcephalophis gracilis
53. Naja hannah
54. Naja naja
55. Notechis scutatus
56. Oxyuranus scutellatus
57. Pelamis platurus
58. Praescutata viperina

5. Snakes of India, Southeast Asia, The Far East, Australia, and Pacific Islands—Continued.

59. Pseudechis australis
60. Pseudechis papuanus
61. Pseudechis porphyriacus
62. Pseudelaps mulleri
63. Thalassophis anomalus
64. Trimeresurus albolabris
65. Trimeresurus elegans
66. Trimeresurus flavomaculatus
67. Trimeresurus flavoviridis
68. Trimeresurus gramineus
69. Trimeresurus halieus
70. Trimeresurus jerdoni
71. Trimeresurus macgregori
72. Trimeresurus monticola
73. Trimeresurus mucrosquamatus
74. Trimeresurus okinavensis
75. Trimeresurus popeorum
76. Trimeresurus puniceus
77. Trimeresurus purpureomaculatus
78. Trimeresurus sumatranus
79. Trimeresurus stejnegeri
80. Trimeresurus trigonocephalus
81. Trimeresurus walgeri
82. Vipera russelli

Sea Snake; (*Aepysurus eydouxii*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 129–142; Subcaudal (Tail) Plates: 23–42 (single); Anal Plates: divided; Temporal (Head) Shields: 1–2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Poison fangs moderate, followed after a short interspace by 8–10 grooved teeth; anterior madibular (lower jaw) teeth feebly grooved; scales overlapping (imbricate); snout short, rostral visible from above; nostrils superior, usually valvular; nasals in contact with each other; upper head shields regular and large or broken up into scales; 6 upper labials, 4th largest and touching the eye; two pairs of chin shields, 2nd pair separated by an azygous shield; prefrontals not in contact with supralabials, usually undivided but sometimes divided on one or both sides, longitudinally into two parts; parietals divided or undivided; nasals touch two upper labials; ventrals large, keeled in middle; length 490 mm; or about two feet, average; maximum about 3 feet.

Color: Dark brown above with crossbands of yellow, black-edged scales, often broken up on the vertebral line; these bands widen toward the belly which is yellow with or without dark brown spots.

Distribution: Tropical waters; throughout the Malay Archipelago and Indian and Western Pacific Oceans.

Death Adder; (*Acanthophis antarcticus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 113–130; Subcaudal (Tail) Plates: 41–51; Anal Plates: entire; Temporal (Head) Shields: 2–3 + 2–4; Pre- and Post-Ocular Shields: 1 and 2.

Description: Head with elevated sides; eye much shorter than its distance from the mouth; rostral large, twice as broad as deep, with horizontal edge, its upper portion measuring ½ to ⅔ its distance from the frontal; internasals as long as broad or a little broader than long, as long as or shorter than the prefrontals; frontal narrower than the supraocular, twice as long as broad, as long as or a little shorter than its distance from the end of the snout, as long as or a little longer than the parietals; supraocular often raised and angular, horn-like; upper head shields more or less rugose or striated; nasal large, in contact with the single preocular; 2–3 suboculars, separating the eye from the labials; 6–7 upper labials; 4 lower labials in contact with the anterior chin shields, which are as long as or a little shorter than the posterior ones; dorsals more or less distinctly, sometimes faintly keeled; subcaudal single except 5th to 27th paired; length 850 mm; tail 150 mm. Adder-like tapering tail.

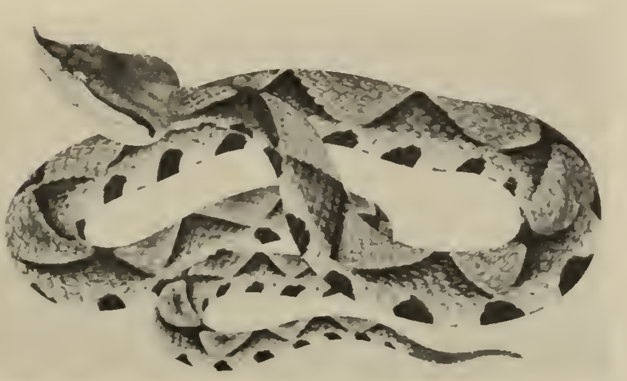
Color: Yellowish, reddish, or greyish brown above with more or less distinct dark crossbands, with or without small black spots; lips with black or blackish spots or bars; sides spotted with black; belly yellowish white, uniform or more or less spotted with brown or black; end of tail yellow or black.

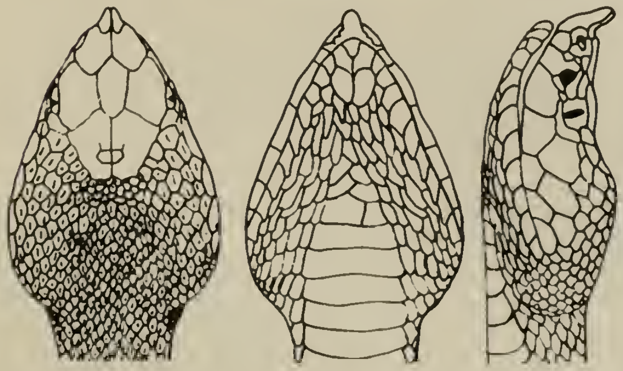
Distribution: Moluccas, New Guinea, Australia.

Hundred Pace Snake, "Hyappoda" (Japanese); (*Agkistrodon acutus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 157–171; Subcaudal (Tail) Plates: 52–60; Anal Plates: entire; Temporal (Head) Shields: 3 large, lower; Pre- and Post-Ocular Shields: 2 and 1.

Description: Snout produced into a pointed dermal appendage directed forwards, covered above by the internasals, beneath by a separated shield above the rostral, which is as deep as broad or deeper than broad; upper head shields finely granvulate; frontal as long as or a little longer than the prefrontals, shorter than the parietals; upper preocular separated from the posterior nasal by a loreal; one postocular and one subocular, separating the eye from the labials; 7 upper labials, 2nd forming the anterior border of the loreal pit, 3rd and 4th largest; 3 large lower temporals, anterior largest; dorsal scales strongly and tubercularly keeled; subcaudals mostly in pairs, 6–13 of the anterior plates single; length 1500 mm; tail 200 mm.





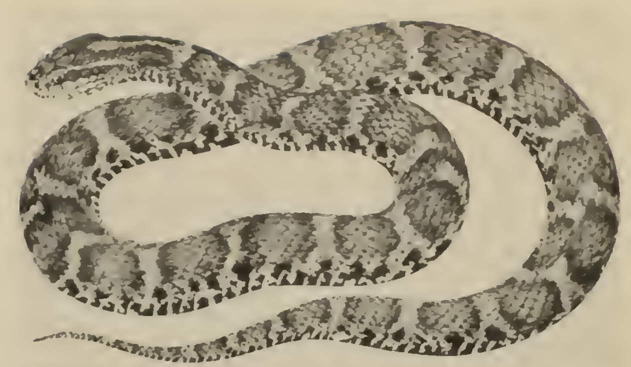
Color: Brown above, with blackish-brown X-shaped markings or alternating **><** -shaped ones; head dark brown above, yellow on the sides, with a black streak from the eye to the angle of the mouth; yellowish beneath, spotted with dark brown and with a lateral series of large black blotches.

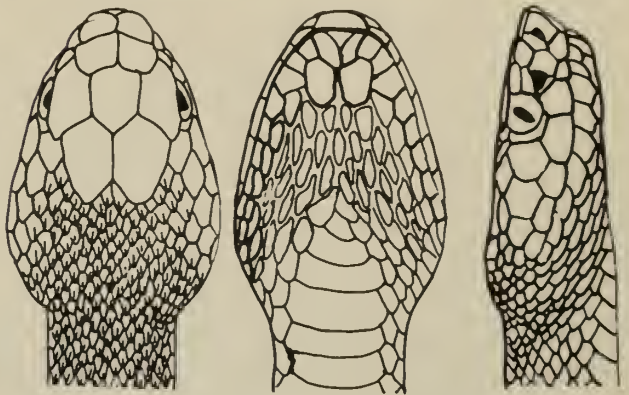
Distribution: China, Viet Nam, Formosa.

Mamushi; (*Agkistrodon halys blomhoffi*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21 (rarely 23); Ventral (Belly) Plates: 137–166; Subcaudal (Tail) Plates: 29–55; Anal Plates: entire; Temporal (Head) Shields: 3 large, anterior largest; Pre- and Post-Ocular Shields: 2 and 1–2.

Description: Obtuse canthus; rostral as deep as broad or slightly broader than deep; a pair of internasals and a pair of prefrontals; frontal as long as its distance from the end of the snout, as long as or a little shorter than the parietals; upper preocular separated from the posterior nasal by a loreal; a subocular; loreal pit separated from the labials; 3 large temporals, anterior largest; upper labials constantly 7; dorsal scales strongly keeled; snout not turned up at end; length 720 mm; tail 100 mm.





Color: Coloration very variable; grey, brown, or red above, with large dark-edged spots disposed in pairs, opposite or alternating, or more or less regular dark crossbands; a dark, light-edged temporal band; upper lip uniform yellowish or red; belly yellowish or red, more or less profusely speckled or spotted with blackish, or nearly entirely black.

Distribution: Eastern Siberia, Sakhalin Island, Korea, China, Japan, Ryukyu Islands, Formosa, Viet Nam, Cambodia, Laos, and Thailand.

Himalayan Pit Viper; (*Agkistrodon himalayanus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21 (rarely 23); Ventral (Belly) Plates: 144–175; Subcaudal (Tail) Plates: 35–52; Anal Plates: entire.

Description: Snout not pointed, not turned up at the end; internasals broader than long, much smaller than the prefrontals, nasal more or less divided into an anterior and a posterior part; canthal shield just reaching the upper surface of the head; 3 large inferior temporals, the scales above being much smaller; 5–7 upper labials, 1st and 2nd sometimes united with one another, the last two united with the temporals; dorsal scales strongly keeled; length 600 mm; tail 90 mm.

Color: Brown above, with dark brown or black spots or wavy crossbars, sometimes indistinct; the spots sometimes confluent to form a festoon on each side of the vertebral line; the interspaces between the crossbars sometimes whitish; a dark temporal stripe from the eye to the angle of the mouth, sometimes extending on to the neck; upper lip light brown with dark spots; brown below, uniform or speckled with black and white.

Distribution: India (Chitral to Sikkim), China.

"Kunn Katuva", "Polon Thelissa" (Sinhala language) Hump-nosed Viper (*Agkistrodon hypnale*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 125–157; Subcaudal (Tail) Plates: 28–46; Anal Plates: entire; Temporal (Head) Shields: 3 enlarged; Pre- and Post-Ocular Shields: 3 and 1.

Description: Snout acutely pointed and turned up at the end; no proper internasals or prefrontals, the top of the snout being covered with more or less irregular scales, the extreme tip sometimes with minute scales; postnasal completely or almost completely fused with the nasal, pointed behind; canthal shield extending well on to the upper surface of the head; lowermost row of temporal shields larger than the upper rows; subcaudals paired or some of them single; vertebral scales very slightly enlarged; supraoculars are wider than the frontal and as long as the parietals; length 480 mm; tail 65 mm.

Color: Variable; greyish or brownish above, heavily powdered and mottled with brown; a series of large, dark, angular or oblong spots on each side; sometimes a series of lateral spots; greyish or yellowish or brownish below, more or less heavily spotted with darker; top of the head usually dark brown; a dark postocular stripe with a light one above it; a pair of longitudinal dark stripes on the nape may be present; tip of the tail often yellowish or reddish.

Distribution: Ceylon and the Western Ghats Hills, India as far north as latitude 16° N.

N.B.—Differentiated from *A. nepa* by supraoculars that are wider than the frontal and as long as the parietals.

Ceylon Hump-Nosed Viper (*Agkistrodon nepa*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 120–135; Subcaudal (Tail) Plates: 28–30; Anal Plates: entire; Temporal (Head) Shields: 3 large; Pre- and Post-Ocular Shields: 3 and 1.

Description: Differs from *A. hypnale* as follows: Tip of the snout always with a distinct hump or projection, covered with minute scales, the projection occupying the middle of the tip of the snout (in *hypnale* it occupies the whole of the tip); fewer ventrals and subcaudals.

Color: Similar to *A. hypnale.*

Distribution: Ceylon. Very common near Hakgalla.

Malayan Pit Viper (*Agkistrodon rhodostoma*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21 (rarely) 19; Ventral (Belly) Plates: 138–166; Subcaudal (Tail) Plates: 35–54; Anal Plates: entire; Temporal (Head) Shields: 2 anterior; Pre- and Post-Ocular Shields: 2 and 1–2.

Description: Snout pointed, somewhat turned up at the end; rostral as deep as broad or a little deeper than broad; a pair of internasals and a pair of prefrontals; frontal as long as or a little longer than its distance from the end of the snout, as long as or a little shorter than the parietals; upper preocular separated from the posterior nasal by a loreal; one or two postoculars and one subocular, separating the eye from the labials; loreal pit separated from the labials; 7–9 upper labials; dorsal scales smooth, subcaudals paired; length 870 mm; tail 105 mm.

Color: Reddish, pinkish or greyish brown above, flecked with brown, and with large subtriangular, dark brown spots edged with black, usually alternating with one another on either side of a dark vertebral line; a broad, dark brown, black-edged stripe, festooned below, from the eye to the angle of the mouth; a light stripe above it extending along the side of the head above the eye to the tip of the snout; this is well marked in the young but may be absent in the adult; dirty whitish below, more or less thickly powdered or spotted with brown; iris golden or spotted with brown.

Distribution: Sumatra, Java, Viet Nam, Cambodia, Laos, Thailand, Malay, Burma, South China.

N.B.—Very poisonous and ill-tempered, but serious or fatal outcome of bite exceptional. This species lays eggs and guards them until hatched.

Sea Snake; (*Astrotia stokesi*); Family: Hydrophidae; Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 47–59; Ventral (Belly) Plates: 226–286; Temporal (Head) Shields: 2–3 overlapping anterior; Pre- and Post-Ocular Shields: 1 and 2.

Description: Dorsal scales strongly impricate, pointed and keeled; a few of the anterior ventrals are entire, the rest longitudinally divided, the two halves overlapping; 8–10 upper labials, 4–6th usually touch eye; body very thick and massive. This is the largest, not the longest, of the sea snakes—maximum length between 5–6 feet.

Color: Orange-red to yellowish brown with 32–36 broad black bands, entire or broken, forming dorsal bars and ventral spots; smaller spots often present between bands; head olive to yellowish.

Distribution: From the Makran Coast, Southeast Iran and the China Sea to the north coast of Australia.

Fea's Viper (*Azemiops feae*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 180–189; Subcaudal (Tail) Plates: 42–53; Anal Plates: entire; Temporal (Head) Shields: 2 anterior; Pre- and Post-Ocular Shields: 2–3 and 2.

Description: Head elliptical, snout short and broad; rostral moderate, broader than deep; internasals and prefrontals subequal in length; frontal a little broader than long, nearly thrice as broad as the supraocular; parietals as long as their distance from the end of the snout; loreal small, pentagonal, as deep as long; 2–3 preoculars; two postoculars; 2 large superposed anterior temporals, the upper along in contact with the postoculars; 6 upper labials, third touching eye, first and second smallest, 4th and 5th largest; 7 lower labials, 1st large and forming a long suture with its fellow, second small; a pair of short chin shields; subcaudals generally paired but in juveniles the anterior ones may be single; length 770 mm; tail 130 mm.

Color: Blackish above, the scales being dark grey in the center and black on the borders, with 15 transverse white bands, one scale wide, some of which are disconnected in the middle and alternate with those on the other side; upper surface of head, from the prefrontals, black, with a yellow median line which is very narrow anteriorly and widens posteriorly, ending on the neck on the eleventh transverse series of scales; end of snout and sides of head yellow; a blackish streak from below the eye to the lower border of the fourth upper labial; another from the postoculars to the upper border of the 6th labial; olive-grey beneath, with some small lighter spots; chin and throat variegated with yellow.

Distribution: Upper Burma, Tong-King; south China and southeast Tibet.

(*Bungarus bungaroides*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 220–237; Subcaudal (Tail) Plates: 44–51; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral broader than deep, just visible from above; internasals shorter than the prefrontals; frontal a little longer than broad, longer than its distance from the end of the snout, shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; two pairs of short, subequal chin shields, the anterior in contact with 3 labials; vertebrals much enlarged, broader than long on the posterior part of the body; subcaudals all in pairs, or a few of the anterior single; length 1400 mm; tail 160 mm.

Color: Black or very dark brown, with white or pale yellowish transverse lines, or narrow bars, formed of a series of spots across the back; those anterior are angular and point forwards; below the lines widen, forming broad bands across the belly; a white line across the snout, and a curved one on each side from the postoculars to the lip; in the adult head markings are sometimes very indistinct.

Distribution: Khasi Hills and Darjeeling districts and Eastern Himalayas, India. A rare snake.

Common Indian Krait; (*Bungarus caeruleus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15–17; Ventral (Belly) Plates: 194–234; Subcaudal (Tail) Plates: 42–52; Anal Plates: entire; Temporal (Head) Shields: 1 + 1–2; Pre- and Post-Ocular Shields: 1 and 2.

Description Rostral broader than deep, visible from above; internasals shorter than the prefrontals; frontal longer than broad, as long as its distance from the end of the snout, shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; two pairs of subequal chin shields, anterior in contact with 3 (rarely 4) lower labials; subcaudals single; length 1200 mm; tail 150 mm.

Color: Black or bluish-black above with narrow white crossbars, usually arranged more or less distinctly in pairs; they are least distinct on the anterior part of the body and may be entirely absent there; in the young the bands are complete; in old specimens they are composed of a series of connected spots, usually a particularly large spot being on the vertebral region; on the sides of the body the bars may or may not widen; a white preocular spot usually present; upper lip and lower parts white; two forms of color pattern can be distinguished, as follows:

1. The transverse bars are narrow and do not, or do not greatly, widen on the sides of the body; there are no vertebral spots.
2. The transverse bars are always distinct and widen on the sides of the body; a vertebral spot is always present.

Distribution: India, Ceylon.

Common Krait, Malayan Krait (*Bungarus candidus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 209–219; Subcaudal (Tail) Plates: 40–50; Anal Plates: entire; Temporal (Head) Shields: 1 + 1 or 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral broader than deep, visible from above; internasals shorter than the prefrontals; frontal longer than broad, as long as its distance from the end of the snout, shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; two pairs of subequal chin shields, anterior in contact with 3 (rarely 4) lower labials; vertebrals much enlarged, broader than long on the posterior half of the body; subcaudals single; tail is normal in shape and tapers to a point; grows to between 3–4 feet; found near human habitations because of fondness of rats for food; not aggressive but has habit of lying in dust in or near paths where they may be stepped on; the poison of this snake is very virulent.

Color: Black or bluish-black above, with from 20–25 broad white crossbars on the body, and 7–10 on the tail; on the forepart of the body the bars are narrower than their interspaces, on the posterior part of the body they are of about the same width; the median portion of each white par is spotted or speckled with black; head black above, the nape sometimes with a light indistinct Λ-shaped mark; upper lip and lower parts white; tail spotted with dark brown below.

Distribution: Thailand, Laos, Cambodia, Viet Nam, Malaya, Burma, East Pakistan, India, Indonesia.

Ceylon Krait, "Karawala" (*Bungarus ceylonicus*); Family: *Elapidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 219–236; Subcaudal (Tail) Plates: 32–42; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral a little broader than deep, just visible from above; internasals shorter than the prefrontals; frontal a little longer than broad, as long as or a little shorter than its distance from the end of the snout, much shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; two pairs of short, subequal chin shields, the anterior in contact with 3 lower labials; vertebrals much enlarged, broader than long; subcaudals single; length 1000 mm; tail 90 mm.

Color: Black above, with from 15–21 white crossbars which are narrow on the vertebral line and widen on the sides of the body; in the young they are well defined, but in the adult are broken up into spots and often indistinct; lower parts uniform white in the juvenile, alternately black and white in the adult; posterior part of head white in the young.

Distribution: Peculiar to Ceylon, where it is common. Found generally in hilly districts but at no great altitude, seldom ascending above 3,000 feet.

Banded Krait (*Bungarus fasciatus*); Family: *Elapidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 200–234; Subcaudal (Tail) Plates: 23–39; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 + 2.

Description: Rostral much broader than deep, visible from above, internasals shorter than the prefrontals; frontal longer than broad, as long as or longer than its distance from the end of the snout, as long as or a little shorter than the parietals; anterior temporal scarcely longer than deep; 7 upper labials, 3rd and 4th touching the eye; two pairs of short, subequal chin-shields; a prominent ridge down the back and tail formed by the spinous processes of the vertebrae; tail ending bluntly, usually more or less swollen at the tip; subcaudals single; this is the largest of the kraits and may reach 7 feet in length; pupil round; prefers jungle environment; more sluggish than *B. candidus* and not at all aggressive.

Color: Alternately banded with black or purplish-black, and yellow or buff, the black bands being as broad as their interspaces or a little broader; a large black mark on the nape continued in a point of the head to between the eyes, and bordered on each side by yellow; the rest of the top of the head brown with yellow mottlings; sometimes the yellow bands have a median stippling of black; sometimes the black bands are not complete below; in specimens from the Malay Peninsula the yellow bands are very pale, sometimes almost white.

Distribution: India, Burma, South China, Indonesia, Malaya, Thailand, Viet Nam, Cambodia, Laos, East Pakistan, Borneo.

Red-headed Krait, Yellow-headed Krait, (*Bungarus flaviceps*); Family: *Elapidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 193–236; Subcaudal (Tail) Plates: 42–54; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral broader than deep, visible from above; internasals much shorter than the prefrontals; frontal as broad as long or slightly longer than broad, as long as its distance from the end of the snout, shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; 3–4 lower labials in contact with the anterior chin shields, which are as long as the posterior ones; vertebrals strongly enlarged; subcaudals partly single, partly paired; reaches over 6 feet.

Color: Black above, with or without a yellow vertebral line, two outer rows of scales black and yellow; head red or yellow; tail and sometimes posterior part of body orange-red.

Distribution: China, Viet Nam, Cambodia, Laos, Thailand, Malaya, Burma, Indonesia, Borneo.

N.B.—This snake is commonly known as the "Yellow-headed" krait, a translation of the specific name *flaviceps.* However, in some parts of the snake's range, the head and tail are bright red, in living specimens (Malayan specimens).

Lesser Black Krait (*Bungarus lividus*); Family: Elapidae; Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 212–225; Subcaudal (Tail)

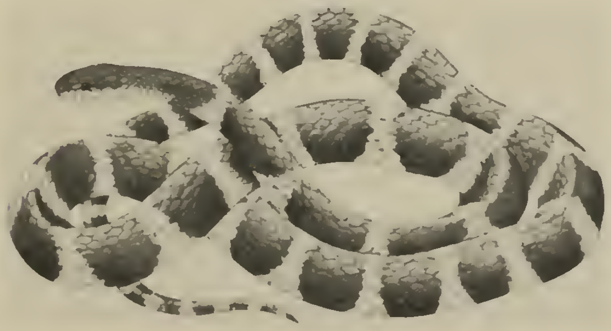
Plates: 37–56; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

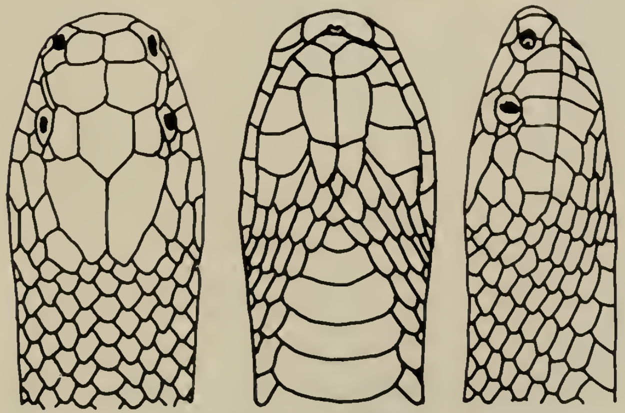
Description: Rostral nearly as deep as broad, visible above; internasals shorter than the prefrontals; frontal longer than broad, as long as its distance from the end of the snout, shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; two pairs of chin shields, anterior longest and in contact with 3 lower labials; vertebrals but feebly enlarged and not broader than long, resembling adjacent scales; length 1020 mm; tail 120 mm.

Color: Uniform black, bluish-black or brown above; upper lip white; lower parts white or pale brown with a more or less distinct dark mottling at the bases of the ventral and subcaudal plates.

Distribution: India, Burma.

Many-banded Krait, "Amac-asa-hebi" (Japanese); (*Bungarus multicinctus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*





Identifying Characteristics: Dorsal (Back) Scale Rows: 15 (rarely 17); Ventral (Belly) Plates: 209–228; Subcaudal (Tail) Plates: 44–54; Anal Plates: entire; Temporal (Head) Shields: 1 + 1–2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral broader than deep, visible from above; internasals shorter than the prefrontals; frontal longer than broad, as long as its distance from the end of the snout, shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; 3 (rarely 4) lower labials in contact with the anterior chin shields; vertebrals enlarged, hexagonal; ventrals rounded; tail moderate to short; subcaudals single; back not ridged; similar to *B. candidus;* length 1100 mm; tail 145 mm.

Color: Black or bluish-black above, with from 27–48 white cross bars on the body and 7–13 on the tail; they usually expand laterally, and on the forepart of the body are farther apart from one another than on the hinder part; the median portion of each bar may be spotted with black; head dark brown or black above; upper lip and lower parts white, tail below mottled and marked with dark brown.

Distribution: Formosa, China, Hong Kong, B.C.C., Viet Nam, Laos, Thailand, Burma, Cambodia, Hainan Is.

Javan Krait (*Bungarus javonicus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15–17; Ventral (Belly) Plates: 210; Subcaudal (Tail) Plates: 46 single; Anal Plates: single; Temporal (Head) Shields: 1–2; Pre- and Post-Ocular Shields: 1 and 2.

Description: See Table IV, Chapter VI. In addition consult the characteristics of the genus *Bungarus.* The species has 7 upper labials, with the 3rd and 4th touching the eye, and 7 lower labials.

Color: This species is all black except white-bordered vertebral scales which become more distinct posteriorly, and white below, flecked with black.

Distribution: Found only in Java, Indonesia.

Spotted Coral Snake (*Callophis gracilis*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 303–324; Subcaudal (Tail) Plates: 21–28; Anal Plates: divided; Temporal (Head) Shields: 1; Pre- and Post-Ocular Shields: 1 and 2.

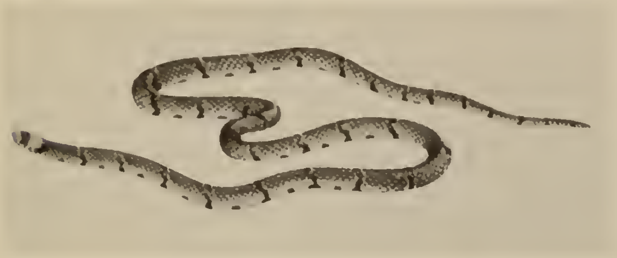
Description: Eye minute, about half as long as its distance from the mouth; rostral broader than deep; frontal as long as its distance from the rostral or the end of the snout, much shorter than the parietals; 6 upper labials, 3rd and 4th touching the eye; two pairs of subequal chin shields, the anterior in contact with 4 lower labials; body slender, tail ending in a blunt point; found in foothill country up to about 3000 feet; mouth is small and probably not too dangerous to man but nothing is known of its venom; length just over 2 feet.

Color: Reddish or pale brown above, scales dark-edged; with three dark brown or black longitudinal lines passing through distant round dark brown or black spots, the lateral spots alternating with the vertebrals; two outer rows of scales dark brown or black with a yellow longitudinal streak; belly and lower surface of tail barred black and yellow; tail similarly marked in black and red.

Distribution: Malaya, Indonesia, Greater and Lesser Suenda Islands.

N.B.—Differentiated from *C. maculiceps* by red belly, less than 200 ventral plates and shorter length in the latter.

Macclelland's Coral Snake, "Wamon-Beni-Hebi" (Japanese); (*Callophis macclellandi*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 182–244; Subcaudal (Tail) Plates: 25–36; Anal Plates: divided; Temporal (Head) Shields: 1 + 1 +1; Pre- and Post-Ocular Shields: 1 and 2.

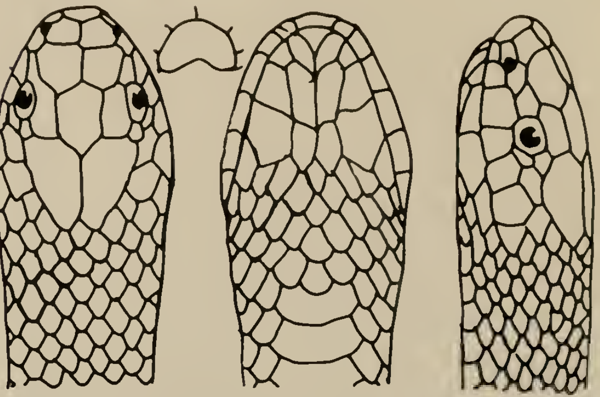
Description: Body slender, head short, depressed, not distinct from neck; internasals much broader than long; prefrontals large, broadly in contact with supraoculars; no loreal; no teeth behind the poison fangs; diameter of eye less than its distance from the mouth; rostral broader than deep; frontal as long as its distance from the end of the snout, much shorter than the parietals; 7 upper labials, 3rd and 4th touching the eye; two pairs of subequal chin shields, the anterior in contact with 4–5 lower labials; length up to about 800 mm; tail up to about 70 mm.

Color: There are about 5 color forms easily recognized (many more exist):

1. Red or brownish above, with regular, narrow, black transverse bars, which may or may not reach the belly; a series of small black spots on each side of the back between the bars may be present; head black above, except for a broad white transverse bar behind the eyes; tip of the snout often light in color; yellowish below, with black crossbars or quadrangular spots. This is the common form.
2. Similar to 1 but with a black vertebral stripe and the transverse bars restricted to the sides of the body, or absent altogether.
3. Similar to 1 but with the black crossbars reduced to transverse vertebral spots and a series of larger spots along the middle of the belly.
4. Uniformly colored above and below, except for a black ventral stripe and three rings on the tail.
5. Purplish-brown above, uniform or with 3 longitudinal series of small indistinct black spots; belly with large black subquadrangular spots.

Distribution: Formosa, China, Hainan Island, Thailand, Burma, Cambodia, Laos, Viet Nam, India.

Oriental Coral Snake; (*Callophis macclellandii formosensis*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 207–240; Subcaudal (Tail) Plates: 32–41 (paired); Anal Plates: paired; Temporal (Head) Shields: 1 + 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Differs from *C.m. macclellandi* (the mainland Asian species) by a greater number of ventrals, subcaudals and transverse dorsal bands. Body slender, head short, depressed, not distinct from neck; rostral well visible from above; internasals much broader than long; prefrontals large; frontal shorter than parietals; no loreal; 7 upper labials, first small, third and sixth largest, third and forth touching eye; lower labials, 6, 4th very large, four of them in contact with anterior chin shields; average length 385 mm.

Color: Reddish brown above, crossed by 27 to 37 regular, narrow, light-edged black bars on the body and 4 to 7 on the tail. The black dorsal rings widen into blotches on the belly; ventrals and half of the outer row of scales are yellow. A black collar about 3 scales wide is found just back of temporals, and another black band across top of head at the level of the eyes; snout grey; rest of the head yellow. A vertebral black spot on neck.

Distribution: Formosa.

Small-spotted Coral Snake; (*Callophis maculiceps*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 174–247; Subcaudal (Tail) Plates: 21–32; Anal Plates: divided; Temporal (Head) Shields: 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: 1–3 minute teeth behind the poison fangs; eye small, measuring at least ⅔ its distance from the mouth; rostral broader than deep; frontal as long as its distance from the end of the snout, much shorter than the parietals; preocular in contact with the nasal; a single very long temporal; 7 upper labials, 3rd and 4th touching the eye and 5th, 6th and 7th touching the temporal; 4–5 lower labials in contact with the anterior pair of chin shields, which are equal to, or a little longer than the posterior pair; length about 2 feet.

Color: Two color forms can be defined:

1. Light brown, reddish or greyish-brown above, with small, distant, sometimes irregular black spots longitudinally arranged along each side of the back, top of head and nape black, the color interrupted by yellow markings which are variable in size and shape; usually a yellow spot on each side of the occiput; upper lip behind the eye yellow; tail with two black rings, one at the base and the other near the tip; yellowish below (red in life); tail below pale blue or grey.
2. Similar to 1 but with a black vertebral strip and no black spots on the body.

Distribution: Burma, Thailand, Cambodia, Laos, Viet Nam, Malaya.

Gwarda (*Demansia nuchalis*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17–19; Ventral (Belly) Plates: 184–224; Subcaudal (Tail) Plates: 55–65; Anal Plates: divided; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye moderate; rostral deeper than broad, the portion visible from above as long as its distance from the frontal; internasals shorter than the prefrontals; frontal broader than the supraocular, 1 and ½ to 1 and ⅔ times as long as broad, as long as or a little shorter than its distance from the end of the snout, ⅔ to ¾ the length of the parietals; nasal entire or semidivided, in contact with the single preocular; 6 upper labials, 3rd and 4th touching the eye, 6th very large; 20–23 dorsal scales on the neck; subcaudals paired; length 1400 mm; tail 200 mm.

Color: Adult uniform brown above, or blackish with pale brown crossbands, yellowish beneath, uniform, or with small red spots; young with a dark brown blotch covering the crown and followed by another on the nape, and small brown spots on the belly.

Distribution: Australia.

(*Demansia olivacea*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 162–215; Subcaudal (Tail) Plates: 79–99; Anal Plates: divided; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye large; rostral broader than deep, visible from above; internasals not more than half the length of the prefrontals; frontal not broader than the supraocular, twice to twice and a half as long as broad, considerably longer than its distance from the end of the snout, a little shorter than the parietals; nasal divided, in contact with the single preocular; two postoculars; lower anterior temporal wedged in between the 5th and 6th upper labials, 3rd and 4th touching the eye; 3–4 lower labials in contact with the anterior chin shields, wihch are a little shorter than the posterior ones; 17 rows of dorsal scales on the neck; subcaudals all or most in two rows; length 1010 mm; tail 240 mm.

Color: Olive, reddish brown, or dark brown above, most of the scales black at the base, some with light edges; snout and sides of the head speckled or vermiculated with dark brown, and with an oblique dark streak below the eye to beyond the angle of the mouth; these markings disappearing in full-grown specimens; lower parts yellowish, uniform or specked with olive, throat and anterior ventrals spotted with blackish in the young; tail yellow or reddish.

Distribution: North Australia and New Guinea.

Whip Snake (*Demansia psammophis*) ; Family: Elapidae; Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 170–225; Subcaudal (Tail) Plates: 69–105; Anal Plates: divided; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 2 and 2 (rarely 3).

Description: Eye large; rostral nearly as deep as broad, visible from above; internasals one half to ⅔ the length of the prefrontals; frontal not broader than the supraocular, twice to twice and a half as long as broad, as long as or longer than its distance from the end of the snout, a little shorter than the parietals; nasal divided, in contact with the single preocular; lower anterior temporal wedged in between the 5th and 6th upper labials; 6 upper labials, 3rd and 4th touching the eye; 3 lower labials in contact with the anterior chin shields which are shorter than the posterior ones; 17–20 rows of dorsal scales on the neck; subcaudals all or most in two rows; length 1420 mm; tail 340 mm.

Color: Very variable; lower surface of tail, at the end, yellow or orange; young with a dark line across the rostral, gradually disappearing with age, and two oblique dark-edged yellow streaks, one in front, the other behind the eye.

Distribution: Southeastern New Guinea and Australia.

N.B.—*D. reticulata* and *D. papuensis* are synonyms for this snake.

(*Demansia textilis*) ; Family: *Elapidae,* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 190–232; Subcaudal (Tail) Plates: 46–73; Anal Plates: divided; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2 (rarely 3).

Description: Eye moderate, rather large in the young; rostral nearly as deep as broad, the portion visible from above measuring one half to two thirds its distance from the frontal; internasals one half to two thirds the length of the prefrontals; frontal not broader than the supraocular, once and three fourths to twice as long as broad, as long as or a little longer than its distance from the end of the snout, a little shorter than the parietals; nasal entire (rarely divided), in contact with the single preocular; 6 upper labials, third and fourth touching the eye, sixth largest; four lower labials in contact with the anterior chin shields, which are nearly as long as the posterior ones; 20–23 dorsal scale rows on the neck; length 1700 mm; tail 290 mm; subcaudals all or most in pairs.

Color: Adult uniform pale brown or dark olive-brown above, whitish or olive beneath; young with a black blotch on the crown, separated from a large black blotch on the nape by an orange crossband; belly spotted with brown or black. There are two color forms: (1) Body with black crossbars and (2) body with no crossbars.

Distribution: Eastern Australia from Cape York to Victoria.

(*Denisonia maculata*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 121–136; Subcaudal (Tail) Plates: 20–30; Anal Plates: entire; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye longer than its distance from the mouth; rostral nearly twice as broad as deep, just visible from above; internasals much shorter than the prefrontals; frontal once and a half to once and two thirds as long as broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; nasal divided (rarely entire), in contact with the single preocular; lower anterior temporal wedged in between the fifth and sixth upper labials; six upper labials, 3rd and 4th touching the eye; 3–4 lower labials in contact with the anterior chin shields, which are shorter than the posterior ones; subcaudals single; length 400 mm; tail 55 mm.

Color: Dark grey-brown or brown above, lateral scales spotted with black; a large dark brown blotch on the head, with some lighter spots or variegations, with a black crescentic border on the nape; sides of head and end of snout pale brown, spotted with black, gular (throat) region spotted with black; ventrals whitish with a dark brown or black spot at the out end of each ventral.

Distribution: Queensland, Australia.

(*Denisonia signata*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 153–170; Subcaudal (Tail) Plates: 41–56; Anal Plates: divided; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye longer than its distance from the mouth; rostral broader than deep, just visible from above; internasals about two thirds the length of the prefrontals; frontal once and ⅔ to twice as long as broad, not or but slightly broader than the supraocular, as long as or a little longer than its distance from the end of the snout; shorter than the parietals; nasal entire, in contact with the single preocular; lower anterior temporal wedged in between the 5th and 6th upper labials; 6 upper labials, 3rd and 4th touching the eye; 3–4 lower labials in contact with the anterior chin shields, which are shorter than the posterior ones; subcaudals single; length 640 mm; tail 120 mm.

Color: Dark olive or black above; head olive-brown, with two yellowish streaks on each side, one along the upper lip, the other from behind the eye along the temple; dark grey or black beneath.

Distribution: Queensland, New South Wales, Australia.

(*Denisonia superba*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

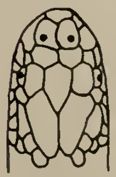
Identifying Characteristics: Dorsal (Back) Scale Rows: 15 (rarely 17); Ventral (Belly) Plates: 145–160; Subcaudal (Tail) Plates: 41–50; Anal Plates: entire; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

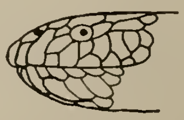
Description: Eye as long as or a little longer than its distance from the mouth (larger in the young); rostral a little broader than deep, just visible from above; internasals ½ to ⅔ as long as the prefrontals; frontal once and ¾ to twice as long as broad, as broad as the supraocular, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; nasal entire, in contact with the single preocular; lower anterior temporal large and wedged in beween the 5th and 6th upper labials; 6 upper labials, 3rd and 4th touching the eye; 3–4 lower labials in contact with the anterior chin shields, which are as long as or shorter than the posterior ones; subcaudals single; length 1010 mm; tail 160 mm.

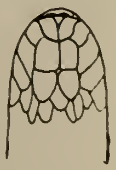
Color: Brownish to dark olive above, the scales often edged with darker; lateral scales often yellow or salmon-red; ventrals yellowish or greyish olive, blackish at the base; young with a black nuchal blotch or collar, which may be bordered behind with yellow; lips yellow, largely spotted with black.

Distribution: New South Wales, Southern Australia, Tasmania.

Sea Snake; (*Disteira cyanocincta*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*







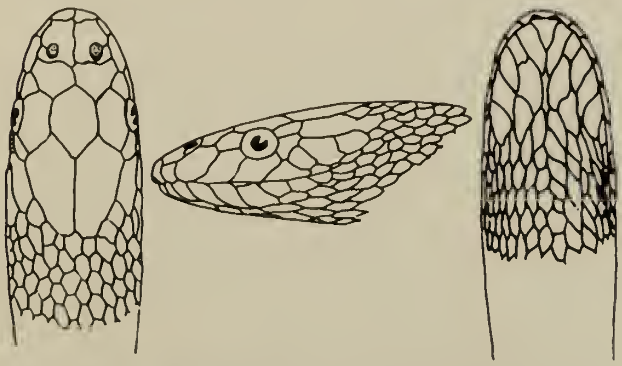
Identifying Characteristics: Dorsal (Back) Scale Rows: 36–45 avg 39; Ventral (Belly) Plates: 281–398 avg 348 (2 keels); Subcaudal (Tail) Plates: 45–53; Anal Plates: 2 pairs, divided; outer half largest and not in contact with inner half; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Head not distinct from neck; rostral broad, 5 sided and visible from above; nasals large and in contact with each other; prefrontals touch 2nd labials; parietals touch superior postoculars and are bordered by 3 temporals (first largest); 7 (rarely 8) upper labials, 2nd very large and touch nasals, prefrontal and preocular; 3rd, 4th and 5th touching eyes; 7th smallest; 8–10 lower labials, 2 anterior ones largest, touching 1st pair of chin shields which are smaller than second pair; scales are overlapping (imbricate) and pointed (anterior part of body); truncate (not pointed) on posterior part of body; each dorsal has a distinct keel or tubercle; scales largest lateroventrally; ventrals are small and have 2 keels; length 1500 mm; tail 140 mm.

Color: Dull blue to greenish olive above; 52–68 yellowish white bars very dim on back; distinct on belly; tail has 5 bars, only the 1st 2 of which extend to under part of tail; head greenish black, throat and neck black.

Distribution: Iran (Persian Gulf), Pakistan, India, Ceylon, Andaman Is., Burma, Thailand, Malaya, Cambodia, Viet Nam, China, Philippine Islands, Formosa, Japan, Borneo, Indonesia, New Guinea, New Britain and Western Pacific Island waters.

Sea Snake; (*Disteira ornata*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 39–50; Ventral (Belly) Plates: 210–300; Subcaudal (Tail) Plates: 44; Anal Plates: 3 prs in males, 2 prs in females (outer largest); Temporal (Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 1 and 2.

Description: Body strongly compressed, tail flattened; head small about ⅕ wider than neck, tapering, convex above; rostral visible from above; eyes large; internasals absent; nasal scale in females, usually entirely broken in two; some females show no evidence of tuberculation on scales; prefrontals in contact laterally with 2nd upper labials; 7–8 upper labials, 2nd largest, 3rd and 4th touching eyes; 6, 7, 8 very small; mental small, triangular, wedge-shaped; 8–10 lower labials, last 2 very small; 1st pair lower labials in contact with and partially inserted between anterior chin shields; scales juxtaposed, usually 6-sided, each with a tubercle on each side; length 1200 mm; tail 130 mm.

Color: Greyish blue above; neck traversed by a few very narrow, lighter lines; blue extends down about half way on side, below which the color is uniform yellowish white; tail greyish with 8 dim narrow yellowish white bars; the division between dorsal and ventral color usually a straight line, but in posterior part, the demarcations zigzag; head slate blue, rather lavender on chin.

Distribution: Iran (Persian Gulf), Pakistan, India, Ceylon, Andaman Islands, Burma, Thailand, Cambodia, Viet Nam, Malayan Archipelago, Indonesia, China, Formosa, Borneo, Philippine Islands, Japan, New Guinea, North Australia, and Western Pacific Island waters.

Hook-nosed Sea Snake (*Enhydrina schistosa*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 37–66; Ventral (Belly) Plates: 239–322; Anal Plates: divided; Temporal (Head) Shields: 1; Pre- and Post-Ocular Shields: 1 and 1–2.

Description: Eye moderate; rostral higher than broad; prefrontals much narrowed anteriorly; frontal small, shorter than its distance from the end of the snout; 7–8 upper labials, 3rd and 4th or 4th only touching the eye, the last 2–3 very small; usually a single anterior temporal; mental narrow, elongate, partly hidden in a groove in the chin; 5 lower in contact with the chin shields which are poorly developed and separated by scales; dorsal scales imbricate with a short keel centrally located; ventrals distinct throughout, a little broader than the adjacent scales; preanals feebly enlarged; length 4 feet, 2 inches (maximum); rostral overlaps lower jaw and looks like a beak; tail about ¼th of total length.

Color: The young are grey or bluish-grey above, whitish below, with dark grey or black annuli broadest dorsally; these markings usually disappear in the adult, the back then being of a uniform greyish color; variations from this are rare.

Distribution: Northwest coast of Africa, Seychelles Islands, Saudi Arabian Peninsula, Iran (Persian Gulf), Pakistan, India, Ceylon, Burma, Thailand, Cambodia, Viet Nam, Malayan Archipelago, Indonesia, New Guinea, and Northern Australian waters.

N.B.—This is the commonest sea snake known. It abounds in most localities on the coast within the limits mentioned.

Oriental Coral Snake (*Hemibungarus boettgeri*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 183–221; Subcaudal (Tail) Plates: 25–30; Anal Plates: divided; Temporal

(Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Maxilla has about six small solid teeth behind fangs; rostral narrowly visible from above; parietals very long, as long as frontal and prefrontal together; usually 7 (rarely 8) upper labials, 3 and 4 touching eye; lower labials 7, four of which are in contact with anterior chin shields; frontal longer than its distance from end of snout.

Color: Pale coral-red above, with 5 longitudinal black dorsal stripes which are broader than the pale coral-red intervals; three longitudinal black stripes on tail; the median dorsal stripe being the broadest. Transverse pattern: 10 to 22 (up to two on tail) irregular black cross-bands, edged in white; cross belly on a single ventral. Underside pale yellow with numerous large and irregular black blotches.

Distribution: Confined to the middle group of the Luchu Archipelago; Okinawa Shima.

Oriental Coral Snake (*Hemibungarus calligaster*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15 (smooth, without apical pits); Ventral (Belly) Plates: 197–257; Subcaudal (Tail) Plates: 19–23 (Paired); Anal Plates: Very wide, single; Temporal (Head) Shields: 2 + 2 + 2; Pre- and Post-Ocular Shields: 2 and 2.

Description: Head not distinct from neck; rostral a little broader than deep, narrowly visible from above; internasals broader than deep; prefrontals broader than deep; frontal nearly twice as long as wide; parietals much longer than frontals; 2 nasals, anterior twice as large as posterior, almost surrounding nostril; no loreal (it is probable that the second nasal is really a loreal element); lower postocular, largest; 6 upper labials, 5th largest, 3rd and 4th touch eye; 7 lower labials; body round, tail short; length 462 mm.

Color: Snout yellowish to red; blue black above with about 68 narrow dotted rows of red; tail red with 2 broad bluish bands; belly barred bluish black and red.

Distribution: All the eastern Philippines, in many localities on Luzon and Southern Mindanao. Type locality is probably Manila.

Oriental Coral Snake; (*Hemibungarus collaris*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15 (Smooth, without pits); Ventral (Belly) Plates: 228–230; Subcaudal (Tail) Plates: 12–22 (paired); Anal Plates: divided; Temporal (Head) Shields: none; Pre- and Post-Ocular Shields: 1 and 2.

Description: Rostral broader than deep, just visible from above; internasals shorter than prefrontals; frontal one and a half as long as broad, as long as its distance from the rostral, as long as the parietals; 7 upper labials, the third and fourth touching the eye, the 6th largest and forming a suture with the parietal; anterior chin shields in contact with the mental (symphysial) and with four lower labials; posterior chin shields as long as the anteriors; total length 430 mm, tail 15 mm; deadly poisonous, but rare; no loreal; pupil round.

Color: Blackish above, barred black and red below; a yellowish occipital collar.

Distribution: Only known locality is around Manila, P.I.

Oriental Coral Snake; (*Hemibungarus japonicus*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 13 (Smooth); Ventral (Belly) Plates: 190–216 (Avg 206); Subcaudal (Tail) Plates: 28–40; Anal Plates: divided; Temporal (Head) Shields: 1 + 1; Pre-and Post-Ocular Shields: 1 and 2.

Description: Maxilla has 4 small solid teeth behind a pair of large grooved fangs; rostral easily visible from above, broader than high; frontal much longer than its distance from tip of snout; parietals very long, as long as frontal and prefrontal together; 7 upper labials, 3rd and 4th through eye, 6th and 7th largest; eye rather large; 7 lower labials, 4 of them in contact with anterior chin shields.

Color: Pale coral red above with one or three narrow black stripes, the median stripe covering the median dorsal row and the corner of the adjoining row on each side; the lateral strip covering the adjoining halves of third and fourth rows from ventrals. Transverse pattern: 12 to 18 black ring (up to 3 on tail); three longitudinal stripes on the tail of all specimens.

Distribution: Confined to the eastern group of the Luchu Archipelago; Amami-Oshima.

Oriental Coral Snake; (*Hemibungarus mcclungi*) ; Family: *Elapidae;* Fang Group: *Proteroglypha.*

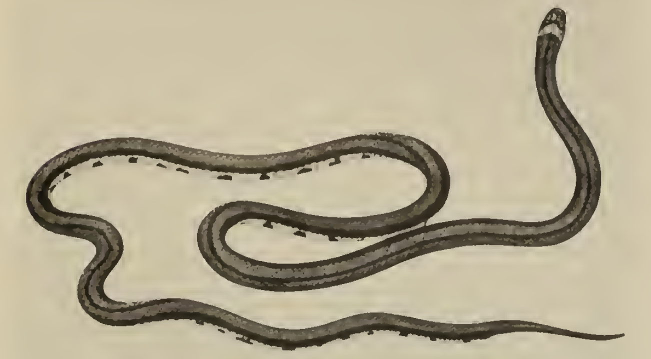
Identifying Characteristics: Dorsal (Back) Scale Rows: 15 (Smooth, without apical pits); Ventral (Belly) Plates: 206; Subcaudal (Tail) Plates: 21 (paired); Anal Plates; single; Temporal (Head) Shields: 2: Pre- and Post-Ocular Shields: 1 and 2.

Description: Differs from *H. calligaster* in having a shorter, stouter body; a larger, more elongate head; the second labial in contact with the preocular; a lower average of ventrals.

Color: (In alcohol) Above cream white traversed by 22 purplish bands about 6 scales wide; some of these bands are partially divided transversely by a light streak, visible ventrally and somewhat evident on sides; the first band on neck is broadest and reaches forward to prietals; the band is broadly interrupted on underside of neck; ventral markings like dorsal but bands more brown than purplish; a black spot is present about eye.

Distribution: Polillo Island, Philippines.

Oriental Coral Snake "Taiwan-hai" (Japanese); (*Hemibungarus sauteri sauteri*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



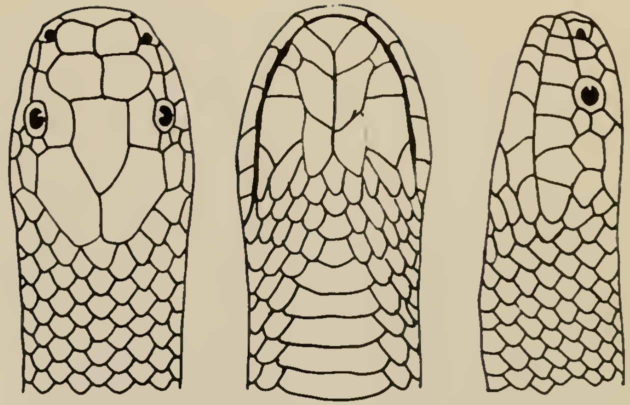
Identifying Characteristics: Dorsal (Back) Scale Rows: 13 (rarely 15); Ventral (Belly) Plates: 249–269; Subcaudal (Tail) Plates: 28–55 (paired); Anal Plates: divided; Temporal (Head) Shields: 1 + 1; Pre- and Post-Ocular Shields: 1 and 2.

Description: Body slender, maxilla has two small teeth after the fangs; loreal absent; 7 upper labials, 3rd and 4th touching eye; head small, rather flattened above, scarcely distinct from neck; internasals broader than long, nearly entering nostrils; small postnasal; prefrontals large, broader than long; frontals six-sided; 7 upper labials, 3rd and 4th entering or touching eye; 6 lower labials, 4 in contact with ACS.

Color: Dark crimson-red above, with three black longitudinal stripes from nape to the tip of tail, of which median strip is narrowest; similar to *H. sauteri hatorii* in other particulars.

Distribution: Seems confined to the southern and eastern parts of Formosa.

Oriental Coral Snake "Hatori-hai" (Japanese); (*Hemibungarus sauteri hatorii*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 13 (smooth); Ventral (Belly) Plates: 238–248; Subcaudal (Tail) Plates: 28–33; Anal Plates: divided; Temporal (Head) Shields: 1 + 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Distinguished from *H. sauteri sauteri* by smaller number of ventrals and lateral black crossbands being edged by narrow white markings. Rostral triangular, wider than high, slightly visible from above; internasals nearly entering nostrils, much wider than long; prefrontals very large; frontal nearly as long as its distance from tip of snout; one large preocular in contact with postnasal, prefrontal, supraocular and third supralabial; supraocular large; eyes small, pupil round; 7 upper labials, 3rd, 6th, and 7th large, 3rd and 4th touching eye; 6 lower labials, 1st pair meeting behind the mental; length 406 mm; tail 32 mm.

Color: Dark crimson red above, with three black longitudinal stripes from nape to tip of tail, outer two being much broader and covering two out scale rows; transverse pattern: about 25 crossbands of black, edged with white laterally, carried across belly on one ventral. Top of head brownish black with ill-defined yellowish border to many head shields; upper labials pale yellow, broadly bordered with black, third and fifth almost black. Underside pale yellow, with numerous large and small rounded spots. Maxilla has 2 small teeth following fangs. Loreal absent.

Distribution: Seems to be confined to the eastern and northern parts of Formosa.

Sea Snake; (*Hydrophis cyanocinctus*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 37–47; Ventral (Belly) Plates: 290–390; Anal Plates: much enlarged; Temporal (Head) Shields: 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: 5–6 maxillary teeth behind the poison fangs; head moderate, body elongate, not slender anteriorly, compressed posteriorly, the greatest diameter in the adult being from two to two and a half times that of the neck; eye small in the adult; frontal usually as long as its distance from the rostral or the end of the snout; temporals superposed 7–8 upper labials, the 2nd in contact with the prefrontal, the 3rd, 4th and 5th, or only two of them, touching the eye; 4 lower labials in contact with the anterior chin shields; both pairs of chin shields well developed and in contact with one another or the posterior pair separated by scales; a series of small scales at the oral margin after the 2nd or 3rd lower labial; scales imbricate throughout, usually with a central keel, which may be broken into a series of 2–3 tubercles; ventrals distinct throughout, anteriorly about twice as broad as the adjacent scales, posteriorly a little less; length to about 6 feet.

Color: Olive or yellowish with black transverse markings which may take the form of complete rings or be feebly marked or absent below, so that the back is barred with black; young specimens have a black band running along the belly.

Distribution: From the Persian Gulf to Japan and the Indonesian-Australian Archipelago. It is common in the Persian Gulf and on the west coast of the Indian Peninsula and shores of Ceylon, but rare on the east coast of India; it has not yet been recorded from the Burmese coast, but is common in the Straits of Malacca; it is common along the western shores of the Gulf of Siam but has not been met with on the eastern side; it is common at Cap St. Jacques, about Manila Bay, and appears to be the commonest sea snake in the Straits of Hainan. South of the equator it is rare.

Sea Snake; (*Hydrophis spiralis*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 33–38; Ventral (Belly) Plates: 295–362; Anal Plates: Considerably enlarged; Temporal (Head) Shields: 1; Pre- and Post-Ocular Shields: 1 and 1 (rarely 2).

Description: 6–7 maxillary teeth behind the poison fangs; head moderate; body elongate, not slender anteriorly, its greatest diameter posteriorly being twice, or a little more, that of the neck; eye small in the adult; frontal as long as its distance from the rostral or the end of the snout; a single large anterior temporal often descending to the labial margin; 6–8 upper labials, the 2nd in contact with the prefrontal, the 3rd, 4th and 5th, or only two of them, touching the eye; 4 lower labials in contact with the chin shields, both pairs of which are well developed and in contact with one another; usually a small scale at the oral margin after the 3rd or 4th lower labial; length usually about 6 feet but there are isolated records up to nine feet (longest of the sea snakes).

Color: Yellowish or yellowish-green, the dorsal scales with black margins and with more or less complete narrow black annuli much narrower than their interspaces (2½–3 times), and feebly dilated vertebrally. Dorsal spots often present between the bands; in the young a black ventral line may be present; head in the young blackish, with a yellow horseshoe-shaped mark above; in the adult usually entirely yellow.

Distribution: From the Persian Gulf to the Malay Peninsula and Archipelago.

Sea Snake (*Kerilia jerdoni*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23 (rarely 19); Ventral (Belly) Plates: 225–278; Temporal (Head) Shields: 1; Pre-and Post-Ocular Shields: 1 and 1.

Description: Head short, the profile of the snout slopes rather sharply down from the level of the eyes, and, seen from above, the head is pointed in front; eyes moderate; rostral as high as broad; prefrontals small, usually not in contact with the supralabials; frontal much longer than broad, nearly as long as its distance from the end of the snout; 6 upper labials, the last often confluent with the single anterior temporal, the 3rd and 4th touching the eye; 7–8 lower labials, the first three in contact with the genials, both pairs of which are well developed and in contact with one another; a slender snake reaching rather over 3 feet.

Color: Olive above, yellowish or white beneath, with black dorsal spots or rhombs which extend round the body to form complete bands in the young; intermediate dorsal spots or bars are usually present; examples from the Bay of Bengal have 19 or 21 scales at mid-body and the dorsal bars number from 30–38 (the typical form); examples from the Gulf of Siam have usually 21 or 23 scales at mid-body and the dorsal bars number from 34–50.

Distribution: East coast of the Indian Peninsula, Ceylon, the Mergui Archipelago and Straits of Malacca; the east coast of the Malaya-Siamese Peninsula; the east coast of Cochin China and South Annam; Borneo.

Sea Snake (*Kolpophis annandalei*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 74–93 (very small); Ventral (Belly) Plates: 320–368.

Description: Ventrals not broader than the adjacent scales; scales very small, in 62–82 rows on the neck, posterior dorsal scales hexagonal, subimbricate or juxtaposed, smooth or with a short keel; rostral shield entire, nasals and prefrontals usually divided and irregular; parietals separated by small scales; 5–6 upper labials, 3rd and 4th touching the eye, 6th, when present, very small; greatest length nearly 3 feet.

Color: Yellowish above, white below, with 35–45 pale grey dorsal bars, much broader than their interspaces on the back, tapering on the sides, head olive brown.

Distribution: Gulf of Siam, coast of Thailand, Java.

N.B.—Easily recognized by the series of small scales separating the parietals.

Sea Snake (*Lapemis curtus*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 30–45; Ventral (Belly) Plates: 151–219; Anal Plates:

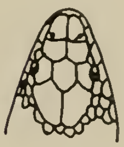
divided, 4–6 scales; Temporal (Head) Shields: 2 or 3; Pre- and Post-Ocular Shields: 1 and 1–2.

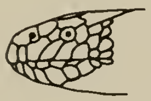
Description: Head large, body stout, short; dorsal scales juxtaposed, usually square or hexagonal (but may be other shapes) with a central tubercle; ventrals very distinct anteriorly, are divided posteriorly with each half having a central tubercle; each parietal shield broken up into 3–4 scales; 7–8 upper labials, 5th to 8th reduced in size, 2nd normally in contact with the prefrontal; 8–9 lower labials, 5th to 9th greatly reduced in size; venom symptoms similar to cobra venom; length 850 mm; tail 85 mm.

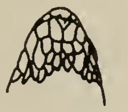
Color: Olive green or greyish above, pale yellow on sides, whitish below; 45–55 dark, sometimes black, transverse bands that are wider than their interspaces, completely encircle the body of juveniles.

Distribution: Persian Gulf to Burma (rare); found in the Mergui Archipelago rarely; common off the northwest coast of Ceylon.

Sea snake; (*Lapemis hardwickii*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*







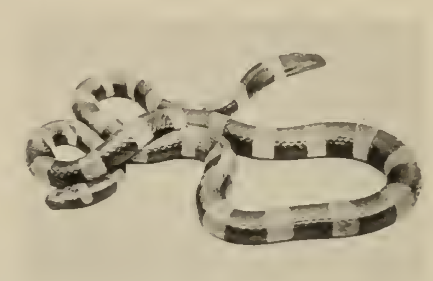
Identifying Characteristics: Dorsal (Back) Scale Rows: 25–36; Ventral (Belly) Plates: 135–237; Subcaudal (Tail) Plates: 33; Anal Plates: 4; Temporal (Head) Shields: 2 or 3 anterior superposed; Pre- and Post-Ocular Shields: 1–2 and 1–2.

Description: Ventrals small and keeled, scarcely discernible from body scales; head moderate size with superior nostrils; rostral not visible from above; 7 upper labials, 2nd largest, touching anterior part of nasal, 3rd and 4th touching the eye, 6th and 7th small; 3 pairs of small chin shields, only 1st pair in contact; 3rd lower labial separated from edge of mouth by two small scales; 4th lower labial largest; scales on body are six sided with a distinct keel on the anterior part of each; about ¼ of specimens have a loreal shield (some have 2 loreals); sometimes loreal may be present on one side and not on the other; one or two preoculars present; scale on about 3 rows on each side of the center of the belly are larger; head large, body short and stout; length between two and three feet.

Color: Greenish or yellowish-olive above, whitish below, with 35–50 olive or grey dorsal bars which taper to a point on the sides; the dorsal bars may encircle the body or may coalesce on the back, and a dark ventral stripe or band may be present; head olive to black with or without yellow markings.

Distribution: Bay of Bengal and the waters bounding the Malay Peninsula and the Malay Archipelago to New Guinea; commonest water snake in Manila Bay.

Amphibious Sea Snake; (*Laticauda colubrina*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*



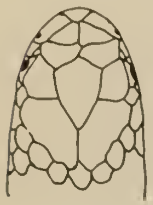
Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23 (rarely 25); Ventral (Belly) Plates: 213–248; Subcaudal (Tail) Plates: 29–47; Anal Plates: divided; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

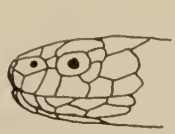
Description: Body subcylindrical, only slightly compressed; rostral higher than broad; an azygous shield separating the prefrontals, sometimes absent; frontal considerably longer than its distance from the end of the snout; 7–8 upper labials, 3rd and 4th touching the eye; 5 lower labials in contact with the genials, both pairs of which are usually well developed and in contact with one another, the anterior pair smaller than the posterior; a double series of elongated scales, the inner series the larger, at the oral margin after the second lower labial; tail strongly compressed, ending in a large scute; belly without a median keel; more terrestrial than other poisonous water snakes; when out of the water they are rather helpless; length 390–1490 mm; tail 150 mm.

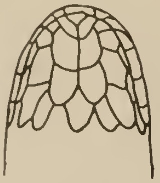
Color: Light or dark bluish-grey above, yellowish below, with black bands of more or less uniform width throughout, or narrowing across the belly; some or all of them may be interrupted below; snout yellow, the color extending backwards on each side of the head above the eye as far as the temporal shields and along the upper lip, leaving a dark bar in between; rest of the head black, this color co-terminous with the band behind the eye, the first and sometimes the second band upon the neck and a streak along either side of the lower jaw, leaving an elongated yellow patch in between.

Distribution: From the Bay of Bengal and the seas south of Japan to the coast of Australia and islands of Oceania, but rare in Indian and Indo-Chinese water; not uncommon at Singapore and in the Andaman and Nicobar Islands. Found along the rocky coasts of the Philippine Islands.

Sea Snake; (*Laticauda laticaudata*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*







Identifying Characteristics: Dorsal (Back) Scale Rows: 19; Ventral (Belly) Plates: 210–240; Subcaudal (Tail) Plates: 25–45; Anal Plates: divided; Temporal (Head) Shields: 1 +2 + 3; Pre- and Post-Ocular Shields: 1 and 2.

Description: Body subcylindrical, of nearly uniform diameter throughout; rostral higher than broad; no azygous shield separating the internasals or prefrontals; frontal longer than its distance from the end of the snout; 7 upper labials, 3rd and 4th touching the eye; 5 lower labials in contact with the genials, both pairs of which are well developed and broadly in contact with each other; dorsal scales impricate and smooth throughout; ventrals about 4 times as broad as long; anal divided and preceded by a second divided scale; a median ventral keel sometimes present on the posterior part of the body; length 1070 mm; tail 110 mm.

Color: Light or dark bluish grey above, yellowish below, with black bands of more or less uniform width throughout, some or all of which may be incomplete below; head black, with a curved yellow mark above, this color often extending forwards to cover the whole of the snout and downwards behind the eye to reach the lip; a median elongated patch of yellow on the jaw below, variable in width and usually connecting with the first yellow ring upon the neck.

Distribution: From the Bay of Bengal and the seas south of Japan to the coast of Australia and islands of Oceania. (New Guinea, Luchu Islands, Fiji Islands, New Hebrides, Tasmania.)

Sea Snake (*Laticauda semifasciatus*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 23; Ventral (Belly) Plates: 188–212; Subcaudal (Tail) Plates: 32–43: Anal Plates: divided; Temporal (Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 1 and 2.

Description: 3 internasals, 3 prefrontals (large); 7 upper labials, 3rd and 4th are largest and touch the eye; 7 lower labials, 1st 3 in contact with chin shields; anal divided, and preceded by a second divided plate; subcaudals paired, rostral divided horizontally, belly with a median keel on posterior half of body.

Color: Dark bluish grey above, paler below; 43 dark brown bands or rings around body (7 on tail) that are widest (3½ scale rows) on the median dorsal line and are separated by pale area 2 scale rows wide; bands only 2½ ventral plates wide, pale areas same width; head uniform brown with yellowish horseshoe shaped mark, the closed part of which rests on the prefrontal shields and extending backwards on the outer edges of the supraoculars, upper postocular and upper temporals to and joining 1st pale line on occiput, a scale row behind the parietals; snout and labials are dark brown like the rest of the head.

Distribution: Philippine Islands (Oriental Negros).

Blue Malaysian Coral Snake (*Maticora bivirgata*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 244–295; Subcaudal (Tail) Plates: 34–53; Anal Plates: entire; Temporal (Head) Shields: 1 + 1–2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye nearly as long as its distance from the mouth; rostral a little broader than deep; frontal large, longer than broad, as long as or longer than its distance from the end of the snout, as long as or a little shorter than the parietals; 6 upper labials, 3rd and 4th touching the eye; anterior chin shields a little longer than the posterior and in contact with 3 or 4 lower labials; subcaudals paired; up to five feet in length, the tail being a little over 1 foot long.

Color: Dark purple or black above; head, tail, and lower parts red. Three color forms are recognized:

1. A fine white lateral line between the borders of the two outer rows of scales.
2. Four white lines along the body, the outer broader and running along the adjacent halves of the two outer rows of scales.
3. A pale blue lateral stripe, occupying the two outer rows of scales.

Distribution: Burma, Thailand, Cambodia, Laos, Viet Nam, Malaya, Borneo, Indonesia (Java, Sumatra), (Color form 2 is found in Borneo); southern China, Ryukyu Islands, Greater and Lesser Sunda Islands.

Banded Malaysian Coral Snake (*Maticora intestinalis*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

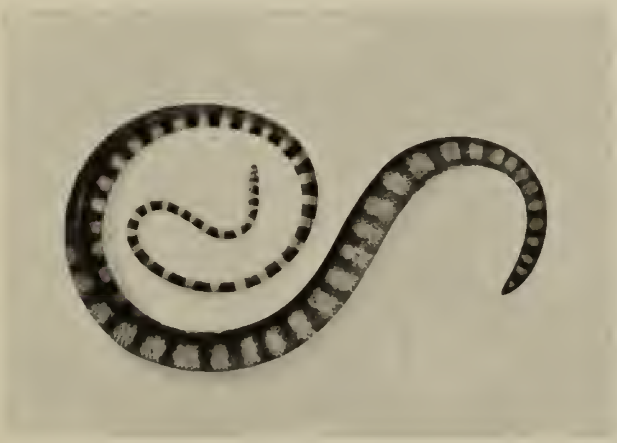
Identifying Characteristics: Dorsal (Back) Scale Rows: 13; Ventral (Belly) Plates: 197–273; Subcaudal (Tail) Plates: 15–33; Anal Plates: entire; Temporal (Head) Shields: 1 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye as long as or a little shorter than its distance from the mouth; rostral a little broader than deep; frontal as long as broad or slightly longer than broad, as long as or longer than its distance from the end of the snout; 6 upper labials, 3rd and 4th touching the eye; 3–4 lower labials in contact with the anterior chin shields, which are as long as or a little longer than the posterior ones; subcaudals paired; length 580 mm; tail 45 mm. When molested this snake makes no attempt to escape, but will often raise its tail, displaying the bright red under surface, and will writhe and tumble about, turning the conspicuously barred belly uppermost. Such behavior is mimicked by the harmless Pipe Snake, *Cylindrophis rufus.*

Color: Brown above with a narrow red or orange vertebral stripe enclosed between two black lines, low down on each side a white stripe bordered above and below with black, the black color extending onto the tips of the ventrals; belly alternately barred black and white, under side of tail barred black and red. The ventral color scheme is almost exactly like that of *Callophis gracilis.* In the mountains the species is represented by a variety called *nigrotaeniata* in which the red and white longitudinal stripes are absent, the body being brown with a vertebral and a pair of lateral black stripes; the ventral surface is the same as in the typical form, but the black crossbars may be relatively narrower.

Distribution: Malay Peninsula, Borneo, Indonesia (Sumatra, Java, Celebes), China, Viet Nam, Cambodia, Laos, Thailand, Burma, Ryukyu Islands, Greater and Lesser Sunda Islands.

Narrow-headed Sea Snake; (*Microcephalophis gracilis*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*



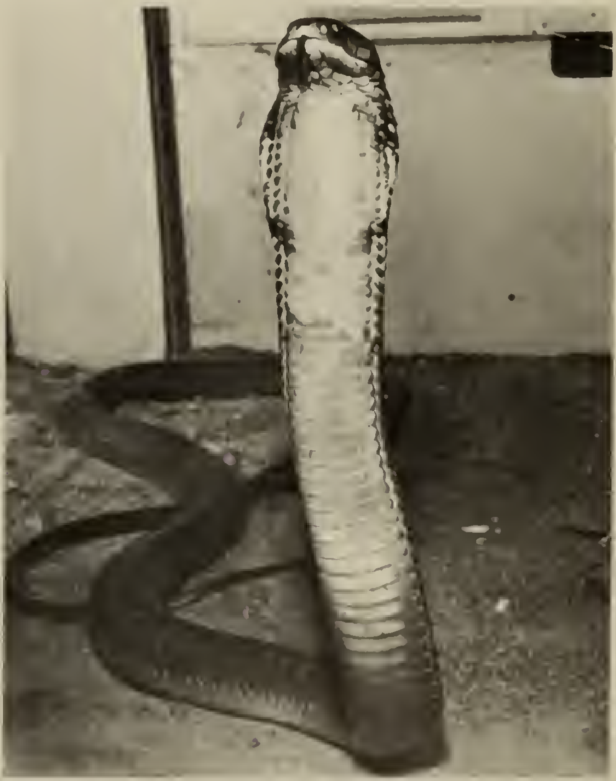
Identifying Characteristics: Dorsal (Back) Scale Rows: 29–43; Ventral (Belly) Plates: 212–360; Temporal (Head) Shields: 2; Pre- and Post-Ocular Shields: 1 and 1.

Description: Head very small, elongate, body long and very slender anteriorly, much compressed posteriorly, its greatest diameter being four to 5 times that of the neck; 17–23 scale rows on neck; snout projecting beyond the lower jaw; eye moderate; rostral large, extending well on to the upper surface of the snout; frontal small, usually shorter than its distance from the rostral; 6 upper labials, 2nd usually in contact with the prefrontal, 3rd and 4th touching the eye; 4 lower labials in contact with the genials, both pairs of which are well developed and in contact with one another; no small scales at the oral margin between the lower labials; posterior scales hexagonal, juxtaposed, broader than long, with 2–3 very small tubercles, one behind the other, the lowermost rows of scales a little larger than the others and with very prominent tubercles or dentate keels in adults; ventrals entire on the slender portion of the body and broader than the adjacent dorsal scales, completely divided posteriorly by a median furrow, the two halves being apposed to one another or alternating; preanals feebly enlarged; length 1025 mm; tail 95 mm.

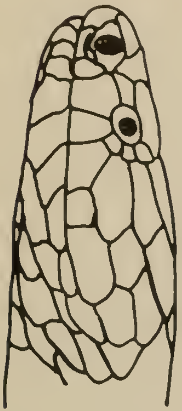
Color: The young are black with a series of whitish dorsal bands or oval lateral spots on the slender part of the body, and more or less complete bands posteriorly, altogether from 40–60 in number; with age the markings lose definition and the adult is usually greyish above, paler below, with the bars or bands indistinctly marked, particularly on the thickest part of the body; head olivaceous to yellowish.

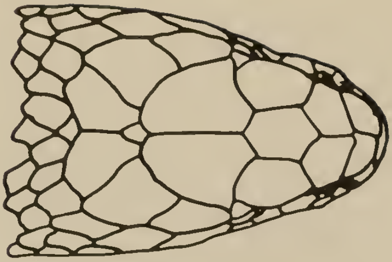
Distribution: From the Persian Gulf to southern China and the coast of Australia; common on the Malabar and Coromandel coasts; recorded in the Gulf of Siam from Patani and Singgora; in southern China from the Straits of Hainan and Macao; Malay Archipelago, Malacca Straits; Indonesia.

King Cobra; Hamadryad; (*Naja hannah*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 215–262; Subcaudal (Tail) Plates: 80–120; Anal Plates: entire; Temporal (Head) Shields 2 + 2; Pre- and Post-Ocular Shields: 1 (rarely 2) and 3.



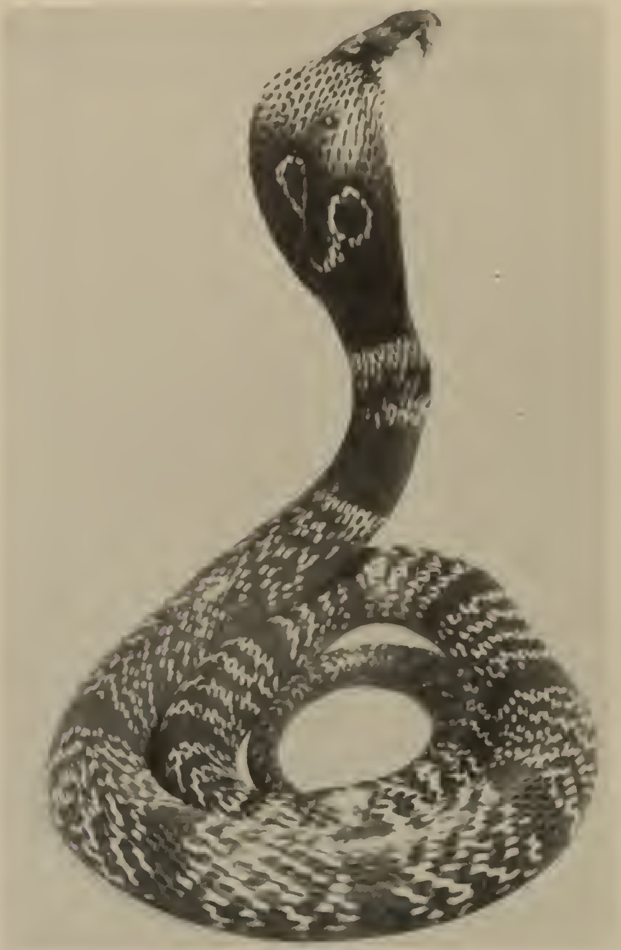


Description: Eye moderate, two fifths to one half the length of the snout in the adult; rostral once and ½ to once and ⅔ as broad as deep, just visible from above; internasals as long as or a little shorter than the prefrontals, separated from the preocular; frontal once and ¼ to once and ½ as long as broad, as broad as the supraocular, as long as its distance from the end of the snout; much shorter than the parietals; a pair of large occipital shields; 7 upper labials, 3rd deepest, 7th longest, 3rd and 4th touching the eye; 4 lower labials in contact with the anterior chin shields, which are as long as or a little longer than the posterior ones; 19–21 scale rows across the neck; subcaudals usually single at the anterior end, paired on the rest of the body; length up to 18 feet, average adult 13–15 feet long; tail forms nearly ⅕ of the total length.

Color: Young are black above, with narrow, white, buff or yellow transverse bars; these are chevron-shaped, pointing forwards on the anterior part of the body, more or less transverse behind; on the sides of the body they expand; head with 4 bars, namely one on the top of the snout, not always distinct, one in front of and one behind the eye, and a crescentic one on the back of the head; the two posterior bars are composed of a series of spots; whitish below, with narrow black or brown crossbars, the color being confined to the edge of the ventral scales and corresponding in position with the dark color of the back; on the posterior part of the body and tail the dark color increases in amount, and may completely supplant the white; as age advances the markings disappear; on the head and fore part of the body they are usually lost entirely, which then becomes brown or olive; on the hind part of the body some trace of the bars always remains, with or without a black edging; the tail may be almost entirely black or olive, with the scales edged with black.

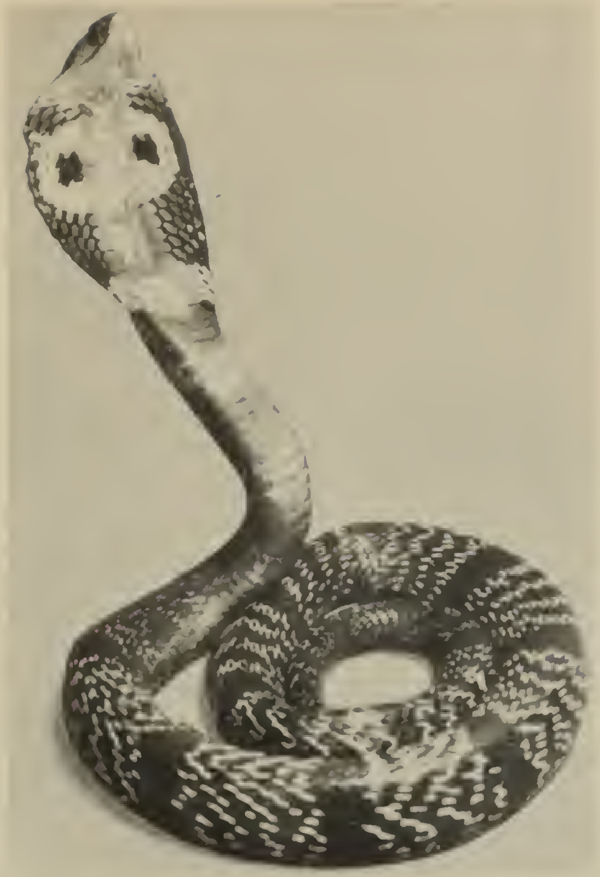
Distribution: India to the Himalayas; Burma, Thailand, Cambodia, Laos, Viet Nam, southern China, Andaman Islands; Malay Peninsula and Archipelago; Philippine Islands.

Indian Cobra, Spectacled Cobra, Cobra de Capello; (*Naja naja*); Family: *Elapidae;* Fang Group: *Proteroglypha.*



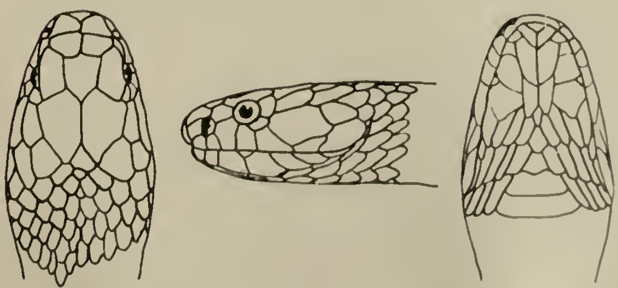
Identifying Characteristics: Dorsal (Back) Scale Rows: 19–25; Ventral (Belly) Plates: 164–213; Subcaudal (Tail) Plates: 43–75; Anal Plates: entire; Temporal (Head) Shields: 2–3 + 3; Pre- and Post-Ocular Shields: 1 and 3 (rarely 2).

Description: Eye moderate, one third to one half the length of the snout; rostral 1 and ¼ to 1 and ½ as broad as deep, its upper portion measuring ¼ to ½ its distance from the frontal; internasals as long as or shorter than the prefrontals, in contact with the preocular; frontal as long as broad or longer than broad, as broad as or little broader than the supraocular, as long as or a little longer than its distance from the rostral; 7 upper labials, 3rd deepest, 7th largest, 3rd and 4th touching the eye; 4 lower labials in contact with the anterior chin shields, which are as long as or longer than the posterior ones; neck dilatable; length very seldom exceeds 6 feet; between the 4th and 5th lower labials usually a small triangular



(cuneate) scale on the margin of the mouth will be found and when present is diagnostic of the species, being found in no other land snake.

Color: The color and pattern of this snake is very variable, the variation being usually correlated with geographical distribution; one form is quite black with the belly bluish-grey and some white marks on the throat which appear on the hood when it is spread (sub-species *sputatrix*); sometimes the white is more extensive and a distinct transverse black bar and a pair of black spots appear against a white ground on the front of the hood; this is the subspecies *leucodira*, which seems to be co-extensive with *sputatrix;* in the northern part of its range, a subspecies known as *kaouthia* is found; it is brown or ochreous with the throat white with black marks at the end of the 11–12 ventrals, which appear as black spots on the spread hood; the spectacle mark on the top or back of the hood, is seen in the type sub-species, *N.n. naja*, but is not seen in the Malayan specimens.



Distribution: China, Viet Nam, Cambodia, Laos, Thailand, Malaya, Burma, East Pakistan, Southern Russia (Transcaspia area), West Pakistan, Ceylon, Afghanistan, Indonesia, Borneo, Formosa.

Tiger Snake (*Notechis scutatus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15–19; Ventral (Belly) Plates: 146–185; Subcaudal (Tail) Plates: 39–61; Anal Plates: entire; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye as long as or a little shorter than its distance from the mouth in the adult, larger in the young; rostral a little broader than deep, the portion visible from above measuring ⅓ to ½ its distance from the frontal; frontal as long as broad or longer than broad, not more than 1 and ½ as long as broad, 1½ to twice as broad as the supraocular, as long as its distance from the rostral or the end of the snout, ½ to ⅔ the length of the parietals; nasal in contact with the single preocular; lower anterior temporal very large and wedged in between the 5th and 6th upper labials and sometimes nearly reaching the lip; 6 (rarely 7) upper labials, 3rd and 5th touching the eye; 3 lower labials in contact with the anterior chin shields, which are as long as or a little shorter than the posterior ones; subcaudals single; length 1280 mm; tail 170 mm.

Color: Olive-brown to blackish above, the skin between the scales black; young with dark crossbands, which may disappear in the adult; belly yellowish or olive, the shields often dark-edged; black and dark brown non-banded forms in Tasmania, Bass Strait Islands and Victoria (rare).

Distribution: Australia and Tasmania.

N.B.—*N. occidentalis* and *N. niger* are sub-species of *N. scutatus.*

Taipan (*Oxyuranus scutellatus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

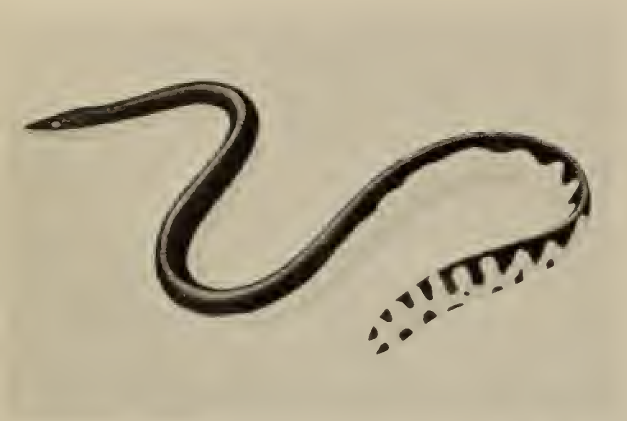
Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 230–233; Subcaudal (Tail) Plates: 61–78; Anal Plates: entire; Temporal (Head) Shields: 2 + 3; Pre- and Post-Ocular Shields: 1 and 2.

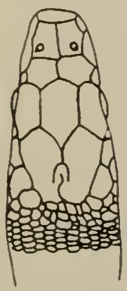
Description: Eye moderate, its diameter exceeding its distance from the mouth; rostral as deep as broad or slightly broader than deep, visible from above; internasals shorter than the prefrontals; frontal nearly as broad as the supraocular, twice as long as broad, as long as its distance from the rostral or the end of the snout, as long as or shorter than the parietals; posterior nasal in contact with or narrowly separated from the preocular, which is single or divided; first lower temporal wedged in between the 5th and 6th upper labials; 6 upper labials, 3rd and 4th touching the eye; 3 lower labials in contact with the anterior chin shields, which are as long as the posterior ones; subcaudals paired; 25–30 scale rows on the neck; length up to 9 feet.

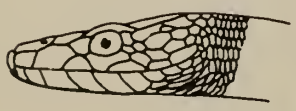
Color: Pale brown or blackish brown above; snout and sides of head paler brown or yellowish; belly yellowish, with very indistinct small dark spots in the young.

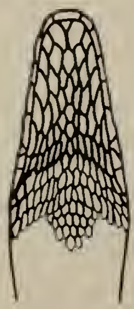
Distribution: Southeastern New Guinea, Queensland, Northern Territory, Australia.

Yellow-bellied Sea Snake; (*Pelamis platurus*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*









Identifying Characteristics: Dorsal (Back) Scale Rows: 49–67; Ventral (Belly) Plates: 264–406 (scarcely differentiated); Subcaudal (Tail) Plates: (scarcely differentiated); Anal Plates: 4, divided; Temporal (Head) Shields: 2–3 + 3 (small); Pre- and Post-Ocular Shields: 1–2 and 2–3.

Description: Head narrow, snout elongate; body much compressed, the greatest diameter posteriorly being more than twice that of the neck; frontal large, as long as its distance from the end of the snout; 7–8 upper labials, 2nd in contact with the prefrontal, 4th and 5th below the eye, usually separated from it by suboculars; anterior pair of chin shields usually distinct and separated by small scales; ventrals usually divided by a median longitudinal furrow or broken up and indistinguishable from dorsal scales; length 880 mm; tail 90 mm.

Color: Color extremely variable; the color varieties that are commonly met with are about six in number but by far the most common one is the bicolored variety: black above, the upper lip usually yellow; tail usually yellowish.

Distribution: **Americas (west coast only):** Mexico, San Salvador, Nicaragua, Guatemala, Costa Rica, Panama, Honduras, Colombia and Ecuador. **Far East:** Japan, Formosa, South China, Viet Nam, Malaya, Indonesia, Cambodia, Burma, India, Ceylon, Pakistan. **Near East:** Afghanistan, Iran, Saudi Arabian Peninsula. **Africa (East coast only):** Eritrea, French Somaliland, Republic of Somalia, Kenya, Tanganyika, Mozambique and Union of South Africa.

N.B.—Inhabits the waters around most tropical Pacific Ocean Islands.

Sea Snake (*Praescutata viperina*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 37–50; Ventral (Belly) Plates: 181–291; Temporal (Head) Shields: variable, usually 1, may be 2–3; Pre- and Post-Ocular Shields: 1–2 and 1–2.

Description: Head short, depressed, distinct from neck, snout broadly rounded; eye moderate; nasal shields subtriangular, as broad as long; prefrontals much broader than long, not in contact with the labials; frontal about as broad as long, twice as broad as the supraocular; 7–9 upper labials, 3rd to 5th, or only two of them, touching the eye; 4 lower labials in contact with the genials, the posterior pair usually larger than the anterior and in contact with one another; 27–34 scale rows on the neck; anterior half of the ventrals are half as broad as the body, narrowing gradually until the posterior ones are not as much as two times as broad as the adjacent scales; preanal shields considerably enlarged; reaches about 3 feet in length.

Color: Three color forms can be distinguished; they bear no relation to geographical areas:

1. Grey above, white below, the two colors meeting on the flank in a fairly clear line of demarcation. Common.
2. Back grey with dark rhomboidal spots or bars (25–35 in number) usually more or less confluent; a common form.
3. Completely banded; a rare form.

Distribution: From the Persian Gulf to Southern China and the Malay Archipelago.

King Brown Snake (*Pseudechis australis*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 199–220; Subcaudal (Tail) Plates: 57–70; Anal Plates: divided; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye rather small, its diameter nearly equalling its distance from the mouth; rostral broader than deep, visible from above; internasals about half as long as the prefrontals; frontal small, not or but slightly broader than the supraocular, once and two thirds to twice as long as broad, as long as its distance from the rostral, ⅔ the length of the parietals; posterior nasal in contact with the single preocular; lower anterior temporal large and wedged in between the 5th and 6th labials; six upper labials, 3rd and 4th touching the eye, 3rd deeper than fourth; 3 lower labials in contact with the anterior chin shields, which are shorter than the posterior ones; 19–20 scale rows on the neck; subcaudals paired except 26–41 of the anterior ones single.

Color: Uniform pale brown above, yellowish beneath.

Distribution: Australia (Victoria, Northern Territory), New Guinea and adjacent islands.

(*Pseudechis papuanus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 221–224; Subcaudal (Tail) Plates: 49–55; Anal Plates: divided; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye small, its diameter less than its distance from the mouth; rostral broader than deep, the portion visible from above measuring ⅓ its distance from the frontal; internasals two thirds the length of the prefrontals; frontal small, as broad as the supraocular, once and a ½ as long as broad, as long as the prefrontals, half as long as the parietals; posterior nasal in contact with the single preocular; lower anterior temporal very large and wedged in between the 5th and 6th labials; six upper labials, 3rd and 4th touching the eye, 3rd deeper than 4th; 3 lower labials in contact with the anterior chin shields, which are a little shorter than the posterior ones; 26–27 subcaudals single, 23–28 paired; length 1900 mm; tail 21 mm.

Color: Uniform blackish, chin whitish.

Distribution: Southeastern New Guinea, Australia and adjacent islands.

Red-bellied Black Snake (*Pseudechis porphyriacus*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17; Ventral (Belly) Plates: 180–200; Subcaudal (Tail) Plates: 50–60; Anal Plates: divided; Temporal (Head) Shields: 2 + 2–3; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye rather small, its diameter nearly equalling its distance from the mouth (larger in the young); rostral as deep as broad or slightly broader than deep, the portion visible from above half as long as its distance from the frontal; internasals ½ to ⅔ as long as the prefrontals; frontal rather small, not broader than the supraocular, 1 and ⅓ to 1 and ⅔ as long as broad, as long as its distance from the rostral, ⅗ to ⅔ the length of the parietals; posterior nasal in contact with the single preocular; 1st lower temporal very large and wedged in between the 5th and 6th labial; 6 upper labials, 3rd and 4th touching the eye, 3rd deeper than 4th; 3 lower labials in contact with the anterior chin shields, which are as long as or shorter than the posterior ones; 18–21 scale rows on the neck; first 5–20 subcaudals single, rest in pairs (exceptionally all divided); length 1580 mm; tail 210 mm.

Color: Black above; outer row of scales red at the base; ventrals red, edged in black.

Distribution: Eastern, Western and Southern Australia; New Guinea.

Muller's Snake (*Pseudelaps mulleri*); Family: *Elapidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 15; Ventral (Belly) Plates: 139–176; Subcaudal (Tail) Plates: 21–35; Anal Plates: divided; Temporal (Head) Shields: 2 + 2; Pre- and Post-Ocular Shields: 1 and 2.

Description: Eye as long as or slightly longer than its distance from the mouth (larger in the young); rostral twice as broad as deep, scarcely visible from above; internasals shorter than the prefrontals; frontal once and ⅔ to twice as long as broad, longer than its distance from the end of the snout, shorter than the parietals; nasal divided, in contact with the single preocular; lower anterior temporal wedged in between the fifth and 6th upper labials; 6 upper labials, 3rd and 4th touching the eye; 3–4 lower labials in contact with the anterior chin shields, which are as long as or shorter than the posterior ones; subcaudals paired; dorsal scales smooth without apical pits; length 500 mm; tail 70 mm. The pair of larged grooved poison-fangs followed, after a wide interspace, by 8–12 small grooved teeth; anterior madibular teeth strongly enlarged, fang-like. Head slightly distinct from neck; eye small with vertically elliptic pupil; no loreal; body cylindrical, ventrals rounded; tail moderate to short.

Color: Brown above; a light vertebral line sometimes present on the anterior part of the body; head sometimes spotted or variegated with dark brown; a more or less distinct dark, light-edged streak on each side of the head, passing through the eye, sometimes continued along the neck; a dark brown nuchal collar may be present in the young; belly yellowish or coral-red, uniform or more or less profusely spotted or speckled with brown or black; gular region brown or black.

Distribution: Moluccas, New Guinea, New Britain.

Sea Snake (*Thalassophis anomalus*); Family: *Hydrophidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 31–35; Ventral (Belly) Plates: 210–256; Anal Plates: feebly enlarged; Temporal (Head) Shields: 2–3 + 3 small; Pre- and Post-Ocular Shields: 1 and 1–2.

Description: Ventrals hardly broader than the adjacent scales, each with a pair of keels; 27–30 rows of scales on neck; posterior scales hexagonal juxtaposed and strongly keeled; shields on the snout and front of the head irregular, the rostral being divided into 4–5 pieces, the nasals separated by a pair of elongated shields, the frontal small sometimes partly or completely divided; 7–8 upper labials, 3rd-5th touching the eye; temporals small, scale-like; internasals narrow, elongate, longer than the prefrontals, as long as the frontal; two pairs of small chin shields, the posterior separated from each other by two scales; length between 2–3 feet.

Color: Body with dark annuli, wider on the back.

Distribution: Gulf of Siam, Borneo, Indonesia (Java, Sumatra) and (probably) Malaya.

White-lipped Pit Viper (*Trimeresurus albolabris*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*

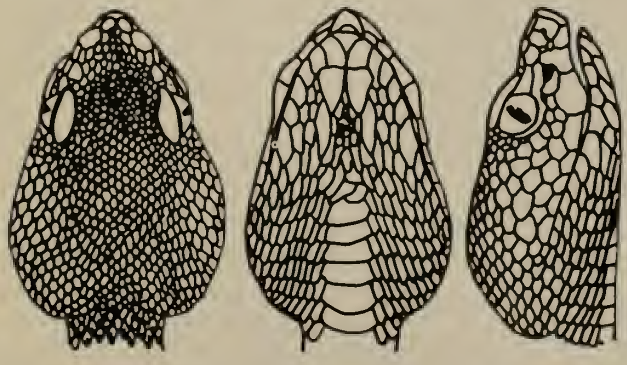
Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 152–176; Subcaudal (Tail) Plates: 49–72.

Description: Dorsal scales keeled; subcaudals paired; head scales small, unequal feebly overlapping and smooth; supraoculars narrow sometimes rather large, entire, 8–12 scale rows between them; internasals 2–4 times longer than adjacent scales; in contact with each other or separated by one scale; 10–11 (rarely 12) upper labials, 1st more or less completely united with nasal, 3rd largest; tail prehensile; length 810 mm; tail 130 mm.

Color: Green above, pale green, blue yellowish or whitish below; ventrals usually have an enameled appearance; a light lateral stripe running from neck to base of tail in males; indistinct or absent in females; upper lip white or pale green, end of tail usually not mottled in brown; a temporal stripe beginning below the eye usually present in males.

Distribution: China, Hong Kong, B.C.C., Viet Nam, Cambodia, Laos, Thailand, Malaya, Indonesia, Formosa.

Elegant Pit Viper; (*Trimeresurus elegans*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 23–25; Ventral (Belly) Plates: 179–191; Subcaudal (Tail) Plates: 63–79; Anal Plates: entire; Pre- and Post-Ocular Shields: 2 and 2–3.

Description: Dorsal scale rows strongly keeled except outer row which is smooth and large; upper labials 8 (rarely 7) 3rd largest; lower labials 10–11; rostral nearly triangular; internasals large, not in contact with rostral; upper head scales smooth anteriorly, keeled posteriorly; 10–14 scales between supraoculars, 1 squarish loreal; 2 preoculars in contact with loreal; postoculars 2–3; temporals numerous, canthus, rostralis sharp.

Color: Pale brownish grey above, with a series of dark brown, black-edged blotches along the median line on each side, in some places forming an interrupted zigzag band partly confluent with the blotches; belly yellow, spotted and clouded with grey.

Distribution: Japan, Ryukyu Islands.

(*Trimeresurus flavomaculatus*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*

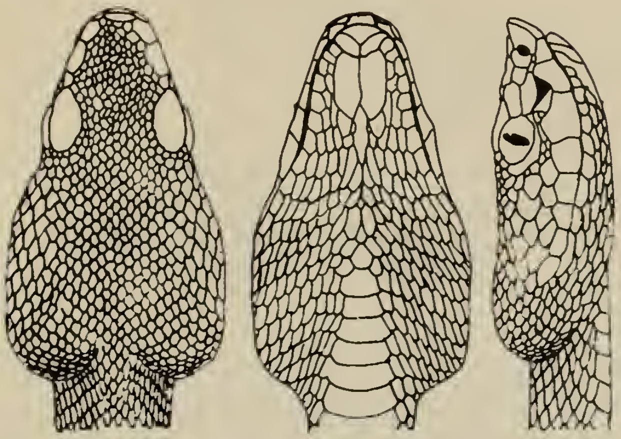
Identifying Characteristics: Dorsal (Back) Scale Rows: 21; Ventral (Belly) Plates: 170–187; Subcaudal (Tail) Plates: 55–73; Anal Plates: entire; Pre- and Post-Ocular Shields: 3 and 3.

Description: Snout rather short; head not especially flattened; rostral broader than high, narrowed at top to less than half its width, bordered behind by two internasal scales, visible from above; supranasals enlarged, separated from each other by 2 scales, and from loreal by a single scale; loreal folded across canthus which is not sharp but rather rounded; supraoculars longer than diameter of eye, extending some distance in front of their anterior vertical level; 10 scales in a line between supraoculars; scales on the head imbricate, smaller on back part of the head; nasal large, nostril pierced in its middle lower part; 9 upper labials, first small, second large, forming anterior border of pit, third largest, last 5 subequal in size; a large, narrow, semicircular subocular touching third labial, separated from others by a single row of enlarged scales; middle and lower preoculars form the upper and lower borders of pit, upper largest, all entering eye; lower temporal scales larger than upper, no trace of keels present; 11–12 lower labials; mental triangular, pointed behind chin shields, in contact with 3 labials; body scales narrow, pointed sharply behind, faintly keeled on the 8 median rows; 25 scale rows on the neck; length 855 mm; tail 143 mm.

Color: Color and markings vary considerably; usually a bright or olive green, either uniform or with numerous brown spots or blotches; the skin between the scales brownish or blackish; the broken line of yellow dots on the outer scale rows is very characteristic of this species; greenish blue below, the ventrals edged with whitish; tail variegated with bluish and lavender brown, lighter toward tip.

Distribution: Found only in the Philippines, on Luzon, Mindanao, and Batan Island, also from Bohol and Jolo.

(*Trimeresurus flavoviridis*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 31–40; Ventral (Belly) Plates: 220–237; Subcaudal (Tail) Plates: 76–91; Anal Plates: entire; Pre- and Post-Ocular Shields: 2 and 1–3.

Description: Rostral as deep as broad or broader than deep; nasal divided or semidivided; upper head-scales very small, flat, juxtaposed, smooth; supraocular large; 1–4 scales separating the internasals in front; 7–12 scales on a line between the supraoculars; 1–3 small postoculars and a subocular, which is in contact with the third labial or separated by one series of scales; temporal scales smooth; 8–9 upper labials, 2nd forming the anterior border of the loreal pit; scales rather feebly keeled, subcaudals paired; length 1215 mm; tail 220 mm.

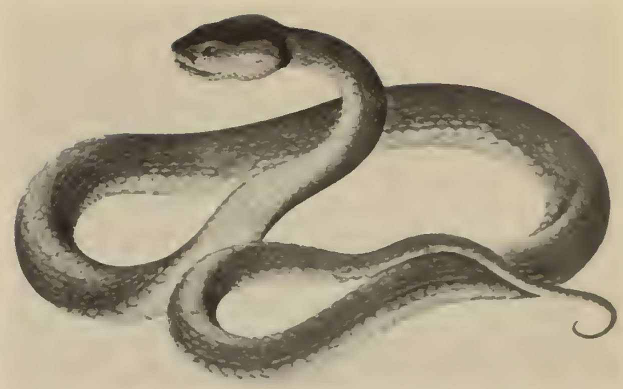
Color: Pale brownish or greenish yellow above, with black markings or a dorsal series of dark rings or rhombs enclosing light spots of the ground color; head with longitudinal black streaks disposed symmertically; belly yellowish or greenish white, with more or less distinct dark spots or variegations.

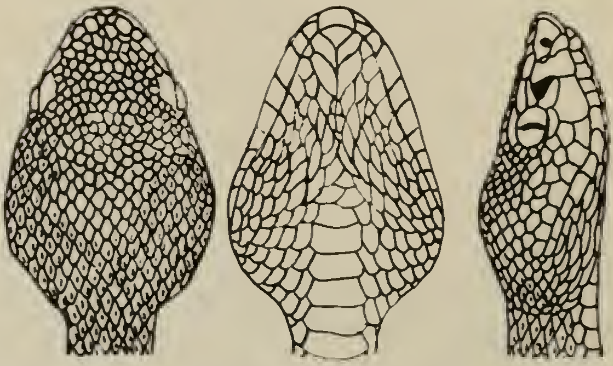
Distribution: Luchu Islands, Japan, Ryukyu Islands.

"Oni-awohabu", Bamboo Viper, Paper Viper, Green Tree Viper; (*Trimeresurus gramineus*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21 (rarely 19 or 23); Ventral (Belly) Plates: 145–175; Subcaudal (Tail) Plates: 53–75; Anal Plates: entire; Pre- and Post-Ocular Shields: 2–3 post.

Description: Snout with distinct canthus; eye small or rather small; rostral as deep as broad or a little broader than deep; nasal usually entire; upper head scales small, smooth, imbricate or subimbricate, 8–13 in transverse series between the supraoculars, which are narrow (rarely divided); internasals in contact or separated by one or two scales; a subocular; latter sometimes in contact with the third labial; usually one or two, rarely three series of scales between the subocular and the labials; temporal scales smooth; 8–12 upper labials, second forming the anterior border of the loreal pit, 3rd largest; dorsal scales nearly smooth or more or less distinctly keeled; subcaudals paired; tail more or less distinctly prehensile; length 870 mm; tail 150 mm.





Color: Bright green above, rarely olive or yellowish, with or without ill-defined blackish crossbands; usually a light, white or yellow streak along the outer row of scales; end of tail often yellow or red; lower parts green, yellow, or whitish.

Distribution: Burma, Malaya, Thailand, Laos, Cambodia, Viet Nam, China, Indonesia and Formosa.

(*Trimeresurus halieus*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21; Ventral (Belly) Plates: 170–182; Subcaudal (Tail) Plates: 52–59; Anal Plates: entire.

Description: Median 10 scale rows keeled; tail prehensile; length 912 mm; tail 130 mm.

Color: Green above, lighter on sides, belly yellowish green; series of irregular reddish-brown spots from head to end of body medially; broken series of yellow spots laterally, more prominent towards tail; tail dark lavender, traversed by 16 black bars.

Distribution: Philippine Islands.

(*Trimeresurus jerdoni*) ; Family: *Crotalidae;* Fang Group: *Solenoglypha.*

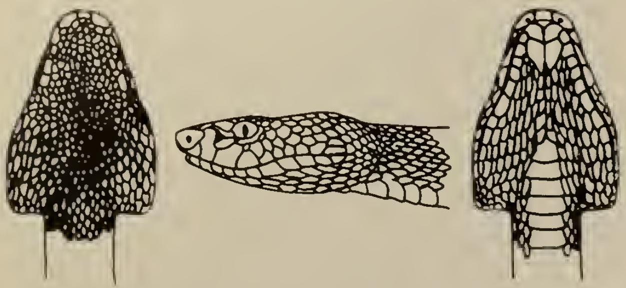
Identifying Characteristics: Dorsal (Back) Plates: 164–193; Subcaudal (Tail) Plates: 64–78.

Description: Completely lacks palatine teeth; head scales small, unequal, smooth, scarcely overlapping; supraoculars large entire, 6–9 scales between them; internasals large, separated by 1–2 scales; 1–3 enlarged scales between internasals and supraoculars; 7–8 upper labials, 3rd largest, 1st entirely separated from nasal; temporal scales smooth; length 990 mm; tail 160 mm. Tale not prehensile.

Color: Greenish yellow or olive above, with dorsal series of transverse rhomboidal or irregular-shaped reddish-brown spots edged in black or almost entirely black; series of vertical spots along sides; head black above with fine yellow lines symmetrically arranged; upper lip yellow with black spots; a black temporal streak; belly yellow profusely spotted with black.

Distribution: South China (Yunnan); Burma (Assam), north of 22° N. and southeast Tibet.

(*Trimeresurus macgregori*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 21; Ventral (Belly) Plates: 175–179; Subcaudal (Tail) Plates: 56–59; Anal Plates: entire; Pre- and Post-Ocular Shields: 2–3 post.

Description: Head flattened above; a narrow elongate subocular, as long as the orbit of the eye; temporal scales perfectly smooth, body scales slightly keeled on 8–10 medial rows; temporal scales distinctly enlarged; enlarged supranasal, separated by an enlarged rectangular scale; 10 upper labials, 2nd high, almost reaching the canthus rostralis, 3rd much the largest; 11 lower labials, 1, 7, 8 largest; 5 pairs of scales between chin shields and 1st ventral; 13 scales between supraoculars; tail prehensile.

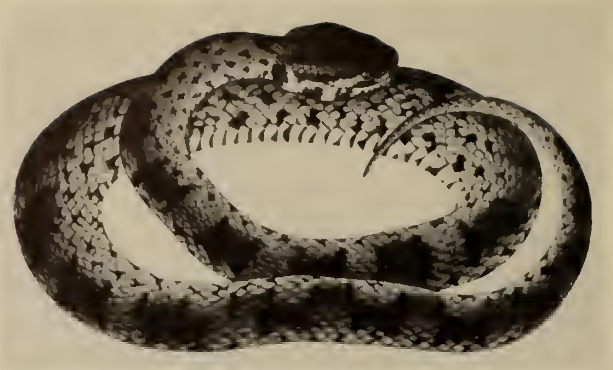
Color: Bright yellow above with darker yellow streak; few small reddish brown spots near tip of tail.

Distribution: Philippine Islands.

Spotted Pit Viper: "Arisan-habu" (Japanese); (*Trimeresurus monticola*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–25; Ventral (Belly) Plates: 132–158; Subcaudal (Tail) Plates: 21–57; Anal Plates: entire.

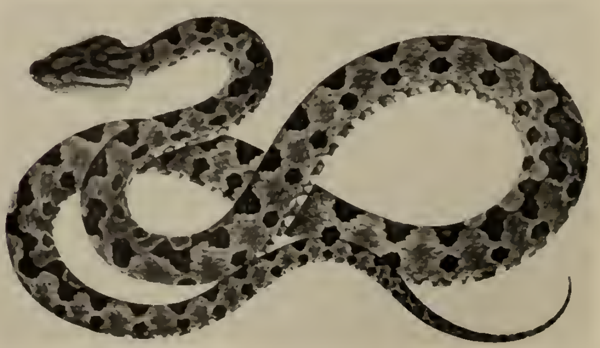
Description: Dorsal scales smooth or feebly keeled; subcaudals paired; snout very short; eye very small; rostral as deep as broad, or a little broader than deep; nasal divided or semidivided; upper head scales small, subimbricate, smooth; supraocular large; internasals separated from each other by one to three scales, rarely in contact; 5–8 scales in a transverse line between the supraoculars; 3–4 rows of scales between the eye and the labials; 8–9 upper labials, 2nd usually forming the anterior border of the loreal pit; temporal scales smooth; an exceptional viper—it lays eggs instead of producing live young as most vipers do; confined to high altitudes where it is quite common; length 740 mm; tail 115 mm.



Color: Brown or yellowish above, with one or two dorsal series of large squarish dark brown spots, and a lateral series of smaller spots; head dark brown above, pale brown or yellowish on the side, with a dark brown temporal streak; lower parts whitish, spotted or powdered with brown, the brown spots sometimes confluent into two stripes.

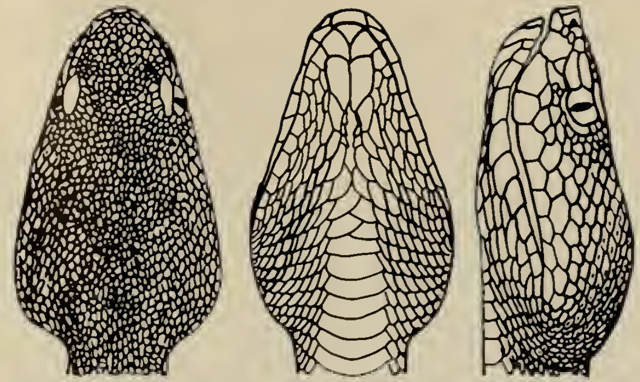
Distribution: Tibet, Himalayas of India and Nepal (2000–8000 feet), hills of Assam, Burma and the Malay Peninsula; Indonesia (Sumatra); China, Viet Nam, Cambodia, Laos, Thailand, and Formosa.

Habu; "Taiwan-habu" (Japanese); *Trimeresurus mucrosquamatus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 23–29; Ventral (Belly) Plates: 183–219; Subcaudal (Tail) Plates: 72–96; Anal Plates: entire; Pre- and Post-Ocular Shields: 3–5 minute postoculars.

Description: Rostral slightly broader than deep; nasal divided or semidivided; upper head scales extremely

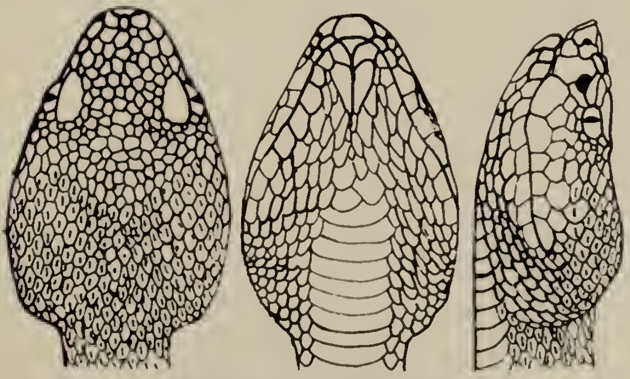


small, granular, smooth or obtusely keeled; supraocular large, or rather narrow; 2–3 scales separating the internasals in front; 10–15 scales on a line between the supraoculars; 3–5 minute postoculars and a subocular, which is separated from the labials by 1, 2, or 3 series of scales; temporal scales smooth; 7–11 upper labials, 2nd forming the anterior border of the loreal pit; scales strongly keeled; tail not or but slightly prehensile; Chinese variety has 13–18 small scales between supraoculars, 8–10 upper labials and 2 loreals; subcaudals paired; length 1050 mm; tail 210 mm. The fangs are large and long.

Color: Irregular dark brown and yellow-rimmed markings scattered on the greyish brown back; a series of irregular blackish blotches are found on each side; belly whitish; head big and typically triangular-shaped with a narrow blackish-brown line from the eye to the angle of the mouth passing the temporal region.

Distribution: Burma (Assam), South China, Formosa.

Okinawa Habu; (*Trimeresurus okinavensis*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*



Identifying Characteristics: Dorsal (Back) Scale Rows: 19–28; Ventral (Belly) Plates: 126–135; Subcaudal (Tail) Plates: 41–55; Anal Plates: entire.

Description: Snout short, obliquely truncate, with sharp raised angle all round; eye rather small; rostral deeper than broad; nasal divided; upper head scales small, subimbricate, smooth on the snout and vertex; 6–9 scales in a transverse series between the supraoculars, which are large, larger than the eye; a pair of scales separating the internasals in front; 3 series of scales between the eye and the labials; temporal scales obtusely keeled; 7–8 upper labials, 2nd entering the loreal pit, 3rd largest; scales strongly keeled; subcaudals paired; length 350 mm; tail 60 mm; tail not prehensile.

Color: Brownish grey or yellowish brown above with darker crossbands or alternating large quadrangular blotches edged in black; upper surface of head dark brown, sides blackish, with a lighter streak along the temple; lower parts brown, with a series of blackish blotches on each side, partly on the ventrals, partly on the two lower rows of scales.

Distribution: Okinawa, Luchu Islands; Japan.

Pope's Pit Viper (*Trimeresurus popeorum*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21–23; Ventral (Belly) Plates: 150–175; Subcaudal (Tail) Plates: 52–75; Anal Plates: entire.

Description: Dorsal scales weakly keeled; 8–12 upper labials, the 2nd bordering the loreal pit; scales between the eyes smooth, small, the supraoculars narrow, separated across the head by 8–13 scales; length of large specimens about 3 feet.

Color: Adult green above, pale green below, without markings; head as the body; tail usually reddish towards the tip; in the young there is a white stripe, bordered below with red, along the lower row of dorsals.

Distribution: Malaya, Indonesia, China, Viet Nam, Cambodia, Laos, Thailand.

Flat-nosed Pit Viper (*Trimeresurus puniceus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–23; Ventral (Belly) Plates: 144–176; Subcaudal (Tail) Plates: 38–65; Anal Plates: entire; Pre- and Post-Ocular Shields: 2–4 post.

Description: Snout short, obliquely truncate, with sharp raised angle all round; eye rather small; rostral as broad as deep or a little deeper than broad; upper head scales small, juxtaposed or subimbricate, smooth on the snout and vertex; 12–14 scales in a transverse series between the supraoculars, which are narrow or broken up into pointed, erect scales; two pairs of internasals; two to four postoculars and 1–2 suboculars, separated from the labials by 2–3 series of scales; temporal scales smooth or obtusely keeled; 10–12 upper labials, 2nd usually separated from the shields in front of the loreal pit, third largest; 1st lower labial divided into two, forming a pair of additional chin shields behind the mental; dorsal scales feebly and obtusely keeled; has a strange flat, bilobed or spatulate snout and distinctive coloration and pointed scales make it unmistakable; length 640 mm; tail 90 mm; tail prehensile.

Color: Grey, brown, or red above, with more or less distinct dark spots sometimes confluent to form a wavy dorsal band; a light streak on each side of the head, behind the eye; belly powdered with dark brown, usually with a lateral series of yellowish-white spots; end of tail red or reddish.

Distribution: Greater and Lesser Soenda Islands, Viet Nam, Cambodia, Laos, Malaya, Indonesia, Borneo.

Shore Pit Viper (*Trimeresurus purpureomaculatus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 25–27 (strongly keeled); Ventral (Belly) Plates: 160–183; Subcaudal (Tail) Plates: 56–76; Anal Plates: entire; Pre- and Post-Ocular Shields: 2–3 small post.

Description: Rostral as deep as broad; nasal entire; upper head scales very small, juxtaposed, convex or obtusely keeled; supraocular very narrow, sometimes broken up; internasals small, separated from each other by one or two scales; 12–15 scales in a transverse line between the supraoculars; 2–3 small postoculars and a subocular, which is separated from the labials by two or three series of scales; 11–13 upper labials, the 4th and succeeding small, the first usually fused with the nasal, the 2nd (usually) forming the anterior border of the loreal pit; temporal scales keeled; scales strongly keeled, subcaudals paired; length 980 mm; tail 150 mm. Found on the sea shore, generally in mangrove or other coastal vegetation; rare inland but common on small islands of the coast of Malaya.

Color: Dark purplish brown, olive or greyish brown above; ventrals dark brown or light greyish brown with dark; a white line may appear along the lowest line of dorsal scales.

Distribution: Greater and Lesser Soenda Islands. Also found in India, Burma, Andaman Islands, Nicobars, and Sumatra and Java as well as the Mergui Archipelago.

Sumatran Pit Viper (*Trimeresurus sumatranus*); Family: *Crotalidae;* Fang Group: *Proteroglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 21 (weakly keeled); Ventral (Belly) Plates: 180–191; Subcaudal (Tail) Plates: 58–82; Anal Plates: entire.

Description: 9–11 upper labials, 2nd borders loreal; scales between eyes are smooth, fairly large; supraoculars large, separated by 4–9 scales; common in lowland jungle inland and in the foothills; length about 4 feet—largest of the Malayan pit vipers.

Color: Bright green above, usually with a row of rather widely spaced white or pinkish spots on each side of the back, and a white line, often bordered with black below, running along the lowest row of dorsals on each side; light yellowish green below; head colored as the body, without markings except for a white streak behind the eye in young specimens. Tail green banded with red in its anterior part, wholly red posteriorly.

Distribution: Malaya, Indonesia (Sumatra).

Stejneger's Palm Viper (*Trimeresurus stejnegeri*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–21; Ventral (Belly) Plates: 155–169; Subcaudal (Tail) Plates: 61–68 paired.

Description: More or less strongly keeled; tail prehensile; 9–10 upper labials, 1st completely separated from nasal; 3rd largest; a single series of small scales between labials and an elongate subocular; supraoculars narrow, sometimes divided by a suture, 9–12 scales on a line between them; temporal scales small rarely feebly keeled; length 750 mm; tail 145 mm.

Color: Green above, pale green or whitish below; a light stripe bordered below with orange or chocolate along flanks and base of tail, mainly on outer row of scales —may be present or partly or completely absent; upper lip pale green, end of tail usually pinkish; may have a series of small white vertebral spots; eyes red.

Distribution: China, Viet Nam, Cambodia, Thailand, Laos, Malaya, Indonesia, Formosa.

"Pala polonga", Green Pit Viper (*Trimeresurus trigonocephalus*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 17–19; Ventral (Belly) Plates: 142–170 (last one or two paired or notched); Subcaudal (Tail) Plates: 53–69 (paired); Anal Plates: entire; Pre- and Post-Ocular Shields: 2–3 post.

Description: 2 supraoculars, occasionally 3; pupil vertical; upper labials, 9–10, 3 enlarged but none touch eye; prehensile tail 1/6 of the total length, ending in a pointed scale; arboreal; may be either diurnal or nocturnal but generally is nocturnal; anterior part of the supraoculars largest; 3–6 scales between them; 1 series of scales between labials and the elongate suboculars; length 835 mm; tail 130 mm.

Color: Green above, uniform or with black elongated branching markings either separate or connected; a black temporal streak; upper surface of head with or without a network of black ones; ventrals yellowish uniform or green; end of tail usually black.

Distribution: Ceylon, up to ,6000 feet.

Wagler's Pit Viper (*Trimeresurus wagleri*); Family: *Crotalidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 19–27; Ventral (Belly) Plates: 127–154; Subcaudal (Tail) Plates: 45–55; Anal Plates: divided; Pre- and Post-Ocular shields: 1, 2, or 3 post.

Description: Head very broad, little longer than broad; snout very short and broad, with more or less distinct canthus; eye very small; rostral as deep as broad or a little broader than deep; nasal entire, upper head scales small, strongly imbricate, keeled supraocular usually narrow or broken into scales; 7–13 scales between the supraoculars; internasals more or less developed or indistinct; a subocular; latter separated from the labials by one or two series of scales, rarely in contact with the third labial; temporal scales keeled; 8–10 upper labials, second not entering the loreal pit, third very large; gular scales obtusely keeled; scales more or less distinctly keeled; subcaudals paired; tail prehensile; length 980 mm; tail 150 mm.

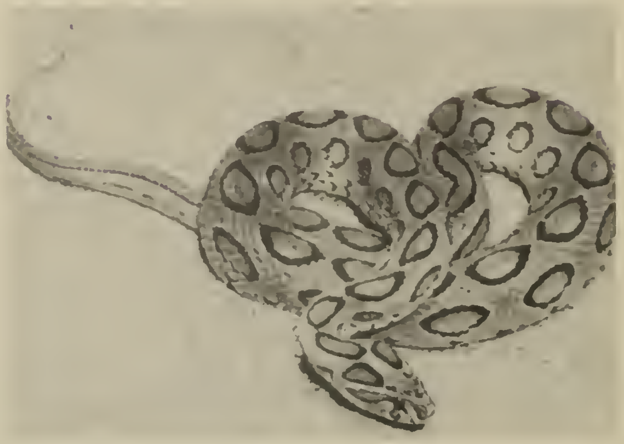
Color: Green, with darker or lighter markings, black and yellow, or nearly entirely black. Five color forms recognized:

1. Green above, with white cross-lines edged behind with blue or purple, or with two dorsal series of small spots or crossbars of the same color; a white line on each side of the head, passing through the eye, edged below with blue or purple; belly white or pale green, with or without black edges to the ventrals; end of tail usually red or reddish brown. (Most common form.)
2. Green above, with small black spots or crossbands; a black streak on each side of the head, passing through the eye; yellow beneath, with or without black edges to the ventrals, with a series of small black spots on each side; end of tail red. (Philippines.)
3. Yellowish green above, the scales edged with dark bottle-green; dark crossbands of the latter color; some specimens dark with scattered yellowish-green dots; ventrals yellow, edged with dark green, with a series of round dark green spots on each side, or dark green with yellow spots; end of tail dark green or blackish. (Sarawak and Borneo.)
4. Green above, with the scales black-edged, with bright yellow black-edged crossbands, or black with yellow crossbands; head black, spotted with yellow; belly bright yellow or yellow and green, ventrals black-edged; end of tail black. (Sumatra, Malaya.)
5. Green above, with large brick-red, black-edged spots; white beneath with black spots and marblings powdered with brick-red; end of tail red. (Celebes.)

Distribution: Malay Peninsula and Archipelago; Indonesia, Philippine Islands, Borneo, Ryukyu Islands.

Russell's Viper; Daboia; Tic-Polonga, Kusari-Hebi; (*Vipera Russelli*); Family: *Viperidae;* Fang Group: *Solenoglypha.*

Identifying Characteristics: Dorsal (Back) Scale Rows: 27–33; Ventral (Belly) Plates: 153–180; Subcaudal (Tail) Plates: 41–64; Anal Plates: entire.



Description: Snout obtuse, with distinct canthus; vertical diameter of the eye less than its distance from the mouth in the adult; rostral in contact with 2–3 apical scales; nostril very large, pierced in the nasal, which is united on the lower portion with the nasorostral; the two shields are separated above by the anterior end of the supranasal which is very narrow and crescentic in form; scales on the top of the head small, imbricate strongly keeled, 2–3 on a line across the tip of the snout; 6–9 between the supraoculars, which are very narrow; 2 scales between the nasal and the eye; 10–15 small scales around the eye; temporal scales small, the lowermost row largest and smooth, the upper rows strongly keeled; 10–12 supralabials, 4th and 5th largest, 3–4 rows of small scales between them and the eye; anterior chin shields are largest; posterior chin shields separated by small scales; length 1250 mm; tail 170 mm.

Color: Light brown above, with 3 longitudinal series of large rounded oval spots; these are usually brown in the center, have a black margin and are edged again with white; the vertebral chain may have a series of black punctate spots; yellowish-white below, uniform or with semilunar black spots; head with large symmetrical dark brown markings and two light streaks which unite at the tip of the snout and diverge behind to reach angle of the jaw; some individuals are very light in color and the dark markings correspondingly indistinct.

Distribution: Pakistan, India, Ceylon, Burma, Thailand, Cambodia, Viet Nam, Laos; Sumatra and Java; South China and Taiwan (Formosa); not confined to the plains—found up to 7000 feet.

CHAPTER VIII

Appendices

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1. DISTRIBUTION CHARTS BY COUNTRY AND CONTINENTAL AREAS

Following the determination of the family to which a given snake belongs, the charts given in this section should be consulted before referring to the generic keys in Chapter VI. In this manner, genera which do not occur in a particular area can be dismissed from further consideration. The distributions given herein may, in many instances, include countries in which the snake actually is not found. The reason for this is that many of the sources of information relative to distribution do not define the distribution in terms of countries and therefore had to be interpreted. For example, the distribution of many snakes is said to be "tropical Africa" or "distributed from —— to ——". Nevertheless, due consideration should be given to all species given on the charts since they are likely not to be grossly in error. In addition, the exact distribution of some species is not known.

Sea snake distribution is also given by country but of course these snakes are limited to the coastal waters of the countries mentioned.

a. North, Central, and South America

	Argentina	Bolivia	Brazil	British Guiana	British Honduras	Canada	Chile	Colombia	Costa Rica	Ecuador	French Guiana	Guatemala	Honduras	Lesser Antilles	Mexico	Nicaragua	Panama	Paraguay	Peru	San Salvador	Surinam	United States	Uruguay	Venezuela
Agkistrodon bilineatus					X			X	X			X	X		X	X				X				
A. contortix contortix																						X		
A. piscivorus															X							X		
Bothrops alternatus	X	X	X															X					X	
B. ammodytes	X																							
B. atrox	X		X	X				X	X	X	X	X		X		X	X	X	X	X	X			X
B. godmani				X	X				X			X	X		X	X	X			X				
B. jararaca	X	X	X		X			X	X	X		X	X	X	X	X	X	X	X					
B. jararacussu	X	X	X															X						
B. lansbergi			X	X	X			X	X	X	X	X	X		X	X				X	X			X
B. neuwiedii	X	X	X																				X	
B. nigriviridis									X															
B. nummifer					X				X			X	X				X			X				
B. schlegeli			X	X				X	X	X	X	X	X	X	X	X	X			X	X			X
Crotalus adamanteus																						X		
C. atrox						X									X							X		
C. basiliscus					X				X			X	X		X	X	X			X				
C. cerastes															X							X		
C. durissus durissus	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
C. durissus terrificus	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
C. horridus						X																X		
C. lepidus															X							X		
C. mitchelli															X							X		
C. ruber ruber															X							X		
C. scutulatus															X							X		
C. tigris															X							X		
C. molossus molossus															X							X		
C. viridis viridis															X							X		
C. willardi															X							X		
Lachesis muta			X	X	X			X	X	X	X	X	X	X		X	X			X	X			
Micruroides euryxanthus															X							X		
Micrurus coralinus	X	X	X	X				X		X	X			X				X	X		X		X	X
M. elegans					X							X			X									
M. frontalis	X		X															X					X	
M. fulvius					X				X			X	X		X	X	X			X		X		
M. hemprichii			X	X				X		X	X			X				X	X		X			X
M. lemniscatus	X		X	X							X										X			
M. mipartitus								X	X	X			X	X		X	X		X	X				X
M. narduccii		X								X									X					
M. psyches				X							X										X			
M. spixii			X																					X
Pelamis platurus								X	X	X		X	X		X	X	X			X				
Sistrurus catenatus						X																X		
S. miliarius																						X		

b. Africa

	Algeria	Angola	Cameroons	Fr. Cameroun	Cent. African Rep.	Chad	Rep. of Congo	Dahomey	Egypt	Eritrea	Ethiopia	Fed. of Rhodesia	Congo	Gabon	Gambia	Ghana	Guinea	Ivory Coast	Kenya	Liberia	Libya	Malagasy Rep.	Mauritania	Morocco	Mozambique	Niger	Nigeria	Portuguese Guinea	Ruanda-Urundi	Senegal	Sierra Leone	Somalia	Spanish Sahara	Sudan	Southwest Africa	Tanganyika	Togo	Tunisia	Uganda	Union of S. Africa	Upper Volta	Zanzibar
Aspis cerastes	X				X	X			X		X										X		X	X		X	X			X		X	X	X				X				
A. vipera	X				X	X			X												X		X			X	X					X	X	X								
Atheris squamigera		X	X	X	X	X	X	X					X	X		X	X		X							X	X	X	X		X		X	X		X	X		X		X	
A. chlorechis																X		X		X							X				X								X			
A. ceratophorus			X	X	X		X	X					X	X		X										X	X		X							X	X		X		X	
A. nitschei							X																						X										X			
Atractaspis aterrima			X	X	X	X	X	X			X	X				X		X								X	X	X									X		X		X	
A. bibronii		X																																						X		
A. corpulenta			X	X	X	X	X	X					X	X		X		X		X						X	X										X		X		X	
A. dahomeyensis								X								X	X	X										X									X				X	
A. irregularis			X	X	X	X	X	X		X	X		X	X		X		X	X	X						X	X		X		X			X			X		X		X	
A. congica		X					X																																			
A. leucomelas																																X										
A. microlepidota			X	X	X	X	X			X	X		X	X					X								X		X			X		X		X			X		X	
Bitis arietans	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
B. atropos																																			X					X		
B. caudalis		X										X																							X					X		
B. cornutus																																			X					X		
B. gabonica		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X				X	X		X	X	X	X
B. nasicornis			X	X	X	X	X	X					X	X		X	X	X	X	X						X	X	X	X		X			X			X		X			
B. peringueyi		X																																	X							
B. inornata												X																												X		
Boulengerina annulata annulata			X	X	X		X					X	X	X					X										X							X			X			
B. annulata stormsi			X	X	X		X					X	X	X					X										X							X			X			
Causus defilippi			X	X	X	X	X			X	X	X	X	X					X						X		X		X			X		X		X				X		
C. lichtensteinii			X	X	X	X	X	X		X			X	X		X		X	X	X						X	X							X			X		X			
C. resimus		X	X	X	X	X	X			X	X		X	X					X								X		X			X		X		X			X			
C. rhombeatus					X	X		X		X	X	X			X	X	X	X	X	X					X	X	X	X	X		X	X		X		X	X		X	X		
Dendroaspis angusticeps		X					X				X	X							X						X				X			X		X	X	X			X	X		
D. jamesoni		X	X	X	X	X	X	X					X	X		X	X	X		X						X	X	X			X			X	X		X					
D. polylepis antinorii											X																															
D. polylepis polylepis											X	X							X						X							X							X			
D. viridis						X		X							X	X		X		X			X			X	X	X		X	X						X					
Dispholidus typus		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	X	X			X	X	X		X	X	X	X
Echis carinatus	X		X	X	X	X		X	X	X	X				X	X	X	X	X	X	X		X	X		X	X	X		X	X	X		X			X	X			X	
E. coloratus	X																				X			X														X				
Elapsoidea guentheri			X	X	X	X	X						X	X					X								X	X	X							X			X			
Hemachatus haemachates												X													X										X					X		
Naja anchietae		X										X																							X				X	X		
N. flava												X													X										X	X				X		
N. goldii			X	X	X	X	X	X					X	X		X		X		X						X	X				X						X				X	
N. haje	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N. melanoleuca		X			X	X	X	X		X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X		X		X	X		X	X	X	
N. nigricollis		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X			X	X	X		X	X	X	X
Pelamis platurus										X									X			X			X							X				X				X		X
Pseudocerastes fieldii									X																																	
Thelotornis kirtlandi			X	X	X	X	X	X				X	X	X					X						X		X		X							X	X		X	X	X	
Vipera ammodytes latastei	X																							X														X				
Vipera lebetina deserti	X																				X			X														X				
Viper superciliaris																									X																	
Walterinnesia aegyptia									X																																	

c. Europe, Near and Middle East (including USSR)

	Afghanistan	Albania	Arabia	Baluchistan	Bulgaria	Denmark	Finland	France	Germany	Great Britain	Greece	Hungary	Iran	Iraq	Israel	Italy	Jordan	Kuwait	Lebanon	Muscat-Oman	Pakistan (West)	Palestine	Poland	Portugal	Quatar	Romania	Socotra Is.	Sicily	Spain	Sweden	Switzerland	Syria	Trucial States	Turkey	USSR	Yugoslavia
Aspis cerastes			X																			X														
Astrotia stokesi													X																							
Atractaspis engaddensis			X												X		X																			
Bitis arietans			X											X	X		X		X			X														
Disteria cyanocincta													X																							
Disteira ornata													X																							
Echis carinatus	X		X										X	X			X		X		X											X				
Echis coloratus			X																			X					X									
Enhydrina schistosa			X										X	X				X		X	X				X								X			
Hydrophis cyanocinctus			X										X					X		X	X				X		X						X			
Hydrophis spiralis			X										X					X		X	X				X		X						X			
Lapemis curtus			X										X					X		X	X				X		X						X			
Microcephalophis gracilis			X										X					X		X	X				X		X						X			
Naja haje			X																			X														
Naja morgani			X										X	X					X														X			
Pelamis platurus			X										X					X		X	X				X		X						X			
Praescutata viperina			X										X					X		X	X				X		X						X			
Pseudocerastes fieldii															X		X																			
P. persicus				X									X																							
Vipera ammodytes ammodytes		X														X										X										X
V. ammodytes hugyi																X												X								
V. ammodytes latastei																								X					X							
V. ammodytes meridionalis		X			X						X								X							X						X		X		X
V. ammodytes transcauscasiana													X																						X	
V. aspis								X	X							X												X	X		X					
V. berus berus					X	X	X	X	X	X	?	X				X							X	X					X	X	X				X	
V. berus bosniensis		X			X																															X
V. berus seoanei																								X					X							
V. lebetina euphratica	X		X	X							X		X	X	X		X	X	X	X	X	X			X							X	X	X		
V. lebetina lebetina	X		X								X		X	X				X											X					X	X	
V. lebetina raddei													X																					X	X	
V. ursinii kaznakovi													X																					X	X	
V. ursinii macrops		X			X																															X
V. ursinii renardi					X								X																					X	X	
V. ursinii ursinii					X			X				X				X										X					X					X
V. xanthina palaestinae															X		X		X			X							X					X		
Walterinnesia aegypti			X												X		X																			

d. India, Southeast Asia, Far East, Australia and Pacific Islands

	Australia	Borneo	Burma	Cambodia	Ceylon	China	Fiji Islands	Formosa	Gulf of Siam	Hainan Is.	Hong Kong, B.C.C.	India	Indonesia	Japan	Korea	Laos	Malacca Straits	Malaya	Molucca Is.	New Britain	New Caledonia	New Guinea	New Hebrides	New Zealand	Pakistan (East)	Philippine Is.	Ryukyu Is.	Siberia	Solomon Is.	Tasmania	Thailand	Tibet	Vietnam	Western Pacific Is.
Aepysurus eydouxii	X	X	X		X				X			X	X				X	X	X	X	X	X							X		X		X	X
Acanthophis antarcticus	X																					X												
Agkistrodon acutus						X																											X	
A. halys blomhoffi				X		X		X						X	X	X											X	X			X		X	
A. himalayanus						X						X																						
A. hypnale					X							X																						
A. napa					X																													
A. rhodostoma			X	X	X	X							X			X		X													X		X	
Astrotia stokesi	X	X	X	X	X	X			X	X		X	X				X	X	X			X				X	X				X		X	
Azemiops feae			X			X																										X	X	
Bungarus bungaroides												X																						
B. caeruleus					X							X																						
B. candidus			X	X		X						X	X			X		X							X						X		X	

d. Far East, Southeast Asia, Australia and Pacific Islands—Continued

	Australia	Borneo	Burma	Cambodia	Ceylon	China	Fiji Islands	Formosa	Gulf of Siam	Hainan Is.	Hong Kong, B.C.C.	India	Indonesia	Japan	Korea	Laos	Malacca Straits	Malaya	Molucca Is.	New Britain	New Caledonia	New Guinea	New Hebrides	New Zealand	Pakistan (East)	Philippine Is.	Ryukyu Is.	Siberia	Solomon Is.	Tasmania	Thailand	Tibet	Vietnam	Western Pacific Is.
B. ceylonicus						X																												
B. fasciatus		X	X	X		X						X	X			X		X							X						X		X	
B. flaviceps		X	X	X		X							X			X		X													X		X	
B. javanicus													X																					
B. lividus			X									X																						
B. multicinctus			X	X		X		X		X																					X		X	
Callophis gracilis													X					X																
C. macclellandi			X	X		X		X		X		X					X														X		X	
C. m. formosensis								X																										
C. maculiceps			X	X												X		X													X		X	
Demansia nuchalis	X																																	
D. olivacea	X																					X												
D. psammophis	X																					X												
D. textilis	X																																	
Denisonia maculata	X																																	
D. signata	X																																	
D. superba	X																													X				
Disteira cyanocincta		X	X	X	X	X		X			X	X	X	X				X		X		X			X	X					X		X	X
D. ornata	X	X	X	X	X	X		X				X	X	X				X				X			X	X					X		X	X
Echis carinatus					X							X																						
Enhydrina schistosa	X		X	X	X							X	X				X	X				X			X						X		X	
Hemibungarus boettgeri																											X							
H. calligaster																										X								
H. collaris																										X								
H. japonicus																											X							
H. mcclungi																										X								
H. sauteri sauteri								X																										
H. sauteri hatorii								X																										
Hydrophis cyanocinctus	X	X	X	X	X	X		X	X	X	X	X	X	X			X	X	X			X			X	X	X				X		X	
H. spiralis			X	X	X				X								X	X							X						X		X	
Kerilia jerdoni		X	X	X	X												X	X													X		X	
Kolpophis annandalei									X																						X		X	
Lapemis curtus			X		X							X																						
L. hardwickii		X	X	X								X	X				X	X	X			X			X	X					X		X	
Laticauda colubrina	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X		X		X		X	X
L. laticaudata	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X	X		X		X		X	X
L. semifasciatus																										X								
Maticora bivirgata		X	X	X		X							X			X		X									X				X		X	
M. intestinalis		X	X	X		X							X			X		X									X				X		X	
Microcephalophis gracilis	X	X	X	X	X	X			X	X	X	X	X				X	X	X			X			X	X					X		X	
Naja hannah			X	X		X						X				X		X								X					X		X	
N. naja		X	X	X	X	X							X			X		X							X						X		X	
Notechis scutatus	X																													X				
Oxyuranus scutellatus	X																					X												
Pelamis platurus	X	X	X	X	X	X		X				X	X	X			X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X
Praescutata viperina		X	X	X	X	X			X	X	X	X	X				X	X				X			X						X		X	
Pseudechis australis	X																					X												
P. papuanus	X																					X												
P. porphyriacus	X																					X												
Pseudelaps mulleri	X																		X	X		X												
Thalassophis anomalus		X		X					X				X					X				X									X		X	
Trimeresurus albolabris				X		X		X			X		X			X		X													X		X	
T. elegans														X													X							
T. flavomaculatus																										X								
T. flavoviridis														X													X							
T. gramineus			X	X	X	X		X					X			X		X													X		X	
T. halieus																										X								
T. jerdoni			X			X																										X		
T. monticola			X	X		X		X				X	X			X		X													X	X	X	
T. mucrosquamatus			X			X		X																										
T. okinavensis														X													X							
T. popeorum				X		X		X					X			X		X													X		X	
T. puniceus		X		X								X	X			X		X															X	
T. purpureomaculatus			X	X								X	X			X		X													X		X	
T. sumatranus													X					X																
T. stejnegeri				X		X		X					X			X		X													X		X	
T. trigonocephalus					X																													
T. wagleri		X											X					X								X	X							
Vipera lebetina euphratica												X																						
Vipera russelli			X	X	X	X		X			X	X	X		X	X		X							X						X		X	

2. SNAKEBITE STATISTICS.

a. **Introduction.** The analysis of snakebite mortality in various parts of the world reveals two interesting features: first, that considerable variation exists from one area to another, and secondly, that high rates are generally found in topographically similiar areas, presumably because of the preponderance of certain species of snakes in that habitat.

The largest number of deaths is reported from India, but if proper allowance is made for the size of the population, it is observed that the highest snakebite mortality rate is recorded from Burma.

The total population of the countries which possess national systems for vital statistics registration and for which snakebite mortality data comparable to the population exposed to risk are available is 1.122 million. On the basis of this figure, the total number of snakebite deaths in the world (excluding China, the USSR, and Central Europe) is estimated to be between 30,000 and 40,000 annually. Of this total, the highest figures are those for Asia (25,000–35,000), followed by South America (3,000–4,000), North America (including Mexico), Europe, and Oceania all record relatively low figures—300–500, 50 and 10, respectively. For Africa, however, it is difficult to make even an approximate estimate, but it is thought that the annual total of snakebite deaths is around 1,000. An estimate of the total snakebite cases is even more difficult to make, but if a guess is to be ventured, it is estimated that about half a million persons are bitten annually by poisonous and non-poisonous snakes.

Another difficulty in ascertaining the numbers of snakebite deaths is that the Manual of International Statistical Classification of Diseases, Injuries, and Causes of Death, adopted by many countries, no provision exists for a separate classification of snakebite deaths. These deaths are included in a broader group, namely E927, in which are grouped all deaths from "accidents caused by bites and stings of venomous animals and insects". This title therefore includes all deaths from bites and stings by venomous animals such as:

Bite by:	*Sting of:*
Centipede	Bee
Insect, venomous	Insects
Snakes	Scorpion
Venomous animals	Wasp

Prior to this classification, which was recommended in 1948, the international recommendation was that countries should follow the International List of Causes of Death (5th Revision, 1938), in which, also, no separate provision existed for tabulating deaths from snakebite alone. In accordance with the 1938 revision of the International List, deaths from snakebite could fall either under Category 175 or under Category 194. Category 175 included deaths from agricultural and forestry accidents and was further subdivided as follows:

(a) Accidents from farm machinery and vehicles (excluding road accidents);
(b) Injuries by animals in farming, etc.;
  ba. venomous animals
  bb. other animals;
(c) other agricultural and forestry accidents.

Thus, the detailed Category 175ba included deaths from snakebite as well as from other venomous animals, provided they occurred in connection with agriculture or forestry.

Category 194 ("attack by venomous animals"), included deaths from snakebite as well as from other venomous animals, except those occurring in the course of agriculture and forestry (175ba).

Thus, reliable statistics for snakebites and deaths from snakebites are relatively scarce. The data herein provided has been extracted from many sources and represents the best information available at the time of publication. Such information serves only to indicate roughly the magnitude of the snakebite problem throughout the world. Generally speaking, it should be borne in mind that statistics of this nature are probably conservative regarding deaths because many persons die without coming under the care of a physician.

b. The Americas.

(1) The United States.

Annual deaths due to poisoning by venomous animals in the USA during the period 1944–50 are shown below:

Year	Deaths
1944	78a
1945	50a
1946	62a
1947	64a
1948	40b
1949	47b
1950	51b

The relative importance of snakebite deaths included in this group for Arizona State is shown by the following comparison:

Deaths from	1929–36	1938–45	1946–48	Total
Snakebite (rattlesnake)	8	6	1	15
Scorpion bite	30	30	4	64
Spider bite and other insects.	6	5	2	13
Total	44	41	7	92

Snakebite deaths in Arizona, therefore, constituted only about 16% of the total deaths included in the broad group of the International Classification. If the same percentage is applied to the total for the entire country, we may presume that perhaps only about 10 to 20 deaths from snakebite occur each year in the USA.

(2) Canada.

Annual total deaths due to attacks by venomous animals during the years 1945–49 are shown below:

Year	Deaths
1945	5
1946	1
1947	----
1948	2
1949	2
Total	10

*Classified under Item 194 of the international List (1938 Revision).

(3) Argentina

No mortality statistics for recent years are available, although it is believed that snakebite constitutes a problem of real importance in the rural sections of certain regions of the country.

(4) Bolivia

Mortality statistics are available only for the group "attack by venomous animals". The hospitals, clinics, and dispensaries of the Ministry of Public Health reported 99, 63, and 115 deaths from attacks by venomous animals during the years 1948, 1949, and 1950, respectively.

(5) British Guiana

Deaths from bites by venomous animals in British Guiana during the period 1944–48 are shown below:

Year	Deaths
1944	4
1945	----
1946	4
1947	5
1948	2
Total	15

(6) Colombia

Annual figures of deaths from injury by venomous animals in agriculture (Item 175ba of the International List (1938 Revision), as well as deaths classified under Item 194 (attack by venomous animals except in the course of agriculture and forestry) of the 1938 Revision, during the five year period 1945–49 are given in the following tabulation:

Year	Deaths (175ba)	Deaths (194)	Total
1945	21	149	170
1946	43	126	169
1947	40	93	133
1948	13	183	196
1949	20	133	153
Total	137	684	821

In 1960 there were 203 deaths from snakebite reported.

(7) Costa Rica

Annual figures of deaths from attacks by venomous animals (classified under Items 175 and 194 of the International List (1938 Revision)) for the years 1943–49 are shown below:

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a. Classified under Item 194 of the International List, 1938 Revision.

b. Classified under Item E927 of the International Classification, 1948 Rev.

Year	Deaths (175)	Deaths (194)	Total
1943	5	24	29
1944	4	13	17
1945	3	21	24
1946	(*)	(*)	(*)
1947	(*)	(*)	(*)
1948	2	9	11
1949	34	3	37
Total	48	70	118

*No data available.

Item 175 also contains figures of accidents in agriculture and forestry arising from other causes, including those from farm machinery and vehicles.

(8) Ecuador

From 1900 to 1946, 2,182 cases of snakebite were treated at Luis Vernaza Hospital, Guayaquil; of these 87 were fatal.

Mortality figures for snakebite for the country as a whole are not available.

(9) El Salvador

Mortality data for snakebite are not available but snakebite is believed to be relatively rare in El Salvador.

(10) French Guiana

Mortality figures for snakebite are not available but venomous snakes are not abundant in this country.

(11) Guatemala

Mortality figures for snakebite are not available but Guatemala has a great variety of venomous snakes, especially at the lower altitudes.

(12) Honduras

Mortality figures for snakebite are not available, but it is believed that cases of snakebite are infrequent, in spite of the large numbers of snakes.

(13) Mexico

Recent statistics for snakebite mortality are not available, however, snakebite caused 153 deaths in 1940 and 215 deaths in 1941.

(14) Nicaragua

Snakebite cases are not frequent. Mortality figures for snakebite are not available separately.

(15) Panama

During the three year period 1941–43, 150 deaths were recorded under Item 194 of the International List (1938 Revision). The proportion of deaths from snakebite falling in this category is not known. The Gorgas Hospital, Panama City, recorded 55 cases of snakebite in the years 1925–51; of these, 7 were fatal.

(16) Paraguay

Mortality figures for snakebite in this country are not available. The greatest number of accidents are said to be caused by *Crotalus terrificus.*

(17) Peru

Separate figures for snakebite mortality are not available. Several species of venomous snakes are present in various regions of the country.

(18) Surinam

Venomous animals do not appear to constitute an important problem in this country but statistics are not available.

(19) Trinidad and Tobago

During the years 1946–50, there were 75 deaths from attacks by venomous animals of different kinds. The majority of these deaths are believed to have been caused by the bites of scorpions. Although at least two species of venomous snakes have been found on the island, cases of snakebite are said to be rare.

(20) Uruguay

Deaths attributed to attacks by venomous animals numbered 15 during the years 1935–46.

(21) Venezuela

During the ten year period 1950–60 there were 1,699 deaths attributed to venomous animals. The majority of fatal cases of poisoning by venomous animals in Venezuela are due to snakes.

c. Africa.

(1) Equatorial Africa

Annual figures for snakebite deaths recorded in hospitals in individual territories are as follows:

	1947	1948	1949	1950	1951
Middle Congo	6	8	15	14	23
Gabon	......	......	......	4	15
Ubangui Chari	......	......	......	6	37
Chad	2	4	5	8	8

(2) West Africa

Annual deaths from snakebite occurring among cases treated in hospitals in West Africa during the period 1948–51 are shown below. In many cases complete information is not available.

Territory	1948	1949	1950	1951
Ivory Coast	2	2	16	4
Upper Volta	2	2	0	4
Dahomey	7	(*)	(*)	21
Sudan	(*)	5	(*)	5
Guinea	(*)	(*)	3	3
Niger	(*)	(*)	0	4
Senegal	(*)	(*)	(*)	3

(3) Angola

The following tabulation shows figures of cases of snakebite and snakebite deaths in Angola during the period 1947–51.

Year	Number of cases	Number of deaths
1947	40	2
1948	18	----
1949	17	----
1950	4	----
1951	9	----

(4) Gold Coast

The total numbers of deaths from snakebite occurring among cases treated in Government, mission, and mine hospitals during the years 1949, 1950, 1951, and 1952 were 5, 5, 6, and 7 respectively.

It is known that a considerable number of cases do not attend hospitals and presumably the mortality among them is high.

(5) Egypt

Annual reported deaths from snakebite in Egypt for the years 1944–48 are given below:

Year	Deaths
1944	27
1945	22
1946	34
1947	41
1948	46
Total	170

(6) Libya

The number of snakebite cases officially registered averages 6 to 8 per year.

(7) Portuguese Guinea

In 1952, six deaths from snakebite were recorded. Reporting by the indigenous population is incomplete.

(8) Mozambique

Separate figures for snakebite are not available. During the five year period 1947–51 the total number of inpatients treated for attacks by venomous animals and insects was 331 of whom 7 died. In the same period, 3,038 cases of such attacks were treated as outpatients, among whom 7 deaths are known to have occurred.

(9) Nigeria

As in many other parts of Africa and elsewhere, the recorded figures relate to only those cases of snakebite which occur sufficiently close to a medical institution, and then only if the victim lives long enough to survive and seek treatment.

The northern region recorded 166 cases and 9 deaths from snakebite during the period 1947–52. In the western region, nine cases of snakebite (seven of which were fatal) were recorded during the years 1948–52.

(10) Southern Rhodesia

During the period 1947–51, four deaths from snakebite were reported by hospitals.

(11) Sudan

Statistical data on deaths from snakebite in the Sudan are not available, although deaths from this cause are known to occur.

(12) Union of South Africa

Figures are available for only the European population in the Union of South Africa. Deaths from snakebite are included under Item 176 ("attack by venomous animals") of the International List (1929 Revision). Annual figures are given below.

Year	Deaths
1934	15
1935	9
1936	13
1937	10
1938	10
Total	57

(13) Other Areas

British Somaliland

Year	Cases	Deaths
1934	12	----
1935	8	----
1936	9	----
1937	17	----
1938	54	----

Gambia

Year	Cases	Deaths
1934	5	----
1935	3	----
1936	7	----
1937	5	----
1938	1	----

Basutoland

Year	Cases	Deaths
1946	(*)	(*)
1947	11	----
1948	17	----
1949	13	----
1950	4	----
1951	34	----

Kenya

Year	Cases	Deaths
1946	404	1
1947	433	----
1948	564	5
1949	515	5
1950	554	12
1951	(*)	(*)

Swaziland

Year	Cases	Deaths
1946	13	----
1947	7	----
1948	17	----
1949	15	----
1950	28	----
1951	29	----

*Data not available.

d. Europe

Deaths from snakebite in Europe are rare and separate figures for snakebite mortality are generally not available. The following figures show in a summary form the mortality caused by venomous animals in various countries of Europe for the periods indicated.

Country	Period	Average annual deaths*	Death-rate per 100,000
Denmark	1946–50	...	...
Spain	1946–48	5.3	0.02
Finland	1946–50	1.2	0.03
France	1944–47	21.5	0.05
Ireland	1943–49	...	...
Italy	1944–48	17.6	0.04
Norway	1946–50	0.4	0.01
Netherlands	1946–50	0.4	0.004
England and Wales	1945–49	8.0	0.02
Scotland	1946–50	0.2	0.004
Sweden	1946–50	0.4	0.006

*Classified under Item 194 of the International List (1938 Revision).

(1) England and Wales

In fifty years there were seven deaths from adder-bite in England and Wales. Only one death from snakebite has occurred in the past 19 years. The Registrar General's Statistical Reviews of England and Wales show that, for the years 1940–48, out of a total of 95 deaths registered under Item 194 of the 1938 Revision of the International List, only two were from snakebite.

(2) Denmark

During the last fifty years only seven deaths have occurred from snakebite in Denmark. All deaths occurred among children between the ages of 1 and 12 years.

(3) Finland

From 1930 to 1955 there were 39 deaths from snakebite in Finland.

(4) Germany

Mortality statistics are not available; however, less than one snakebite per year is recorded in Germany.

(5) Netherlands

Individual statistics for snakebite are not available. From 1951 to 1960 only four deaths were attributed to bites and stings of venomous animals.

(6) Sweden

The following is a summary of information compiled from the statistics of the Swedish Public-Health Service.

Snakebite Cases Hospitalized, 1915–44

Period	Cases	Deaths
1915–24	1,584	7
1925–34	1,754	6
1935–44	1,398	2
Total	4,736	15

The figures show that about 151 persons bitten by snakes were hospitalized annually. From information given by 182 physicians, it was estimated that only one bitten person was hospitalized for 8.5 wounded persons, so that the annual number of bites by *Vipera berus* would be around 1,300 per year. The total number of deaths from 1915 to 1944 was 15. No deaths were returned from the northerly regions, almost all the deaths being registered in central and southern Sweden.

e. **Asia.**

(1) **India**

In 1949 there were 7,396 deaths due to snakebite in India. Numerically the largest number of deaths occurred in the States of Bengal, Uttar Pradesh, Madras, Bombay and Bihar.

(2) **Pakistan**

In west Pakistan the Muzaffargarh district (lying along the Indus River) has a relatively high rate of snakebite mortality, followed by the adjoining district of Dera Ghazi Khan. In East Bengal, snakebite mortality is relatively very high in the districts lying in the Ganges delta. The highest rate (14.2 per 100,000 population) is recorded for the Rajshahi District which borders on the Ganges River, followed by Khulna with a rate of 10.0/100,000.

(3) **Burma**

As compared with other countries of the world, the incidence of snakebite in Burma is very high, the average rate being 15.4 per 100,000 population, with the district of Sagaing recording as high a rate as 36.8 per 100,000. Of a total of 30 districts, 15 have snakebite death-rates as high as 15.0 per 100,000 population or over. The districts with relatively high death-rates from snakebite are those in the lowlying areas traversed by the Irrawaddy and Chindwin Rivers. Two contiguous areas of relatively high incidence are: (1) the southern area of the Irrawaddy delta comprising the districts of Pegu, Thanawaddy, Insein, Manbin and Pyapon, and the contiguous areas on the north; (2) the group of districts with a still higher death-rate in the north, comprising Sagaing, Shwebo, Lower Chindwin, Yamethin, Myingyan, Meiktila, Pakokku, Magwe, and Minby. The highest mortality is generally recorded in December.

(4) **Ceylon**

The following tabulation shows annual deaths from snakebite in Ceylon from 1939 to 1949. On the average, about 300 deaths from snakebite occur each year in Ceylon.

Year	Deaths	Year	Deaths
1939	213	1945	259
1940	202	1946	316
1941	289	1947	296
1942	268	1948	307
1943	299	1949	275
1944	321		

The relative distribution of snakebite mortality in individual provinces of Ceylon shows that the largest death-rate is reported from the North-Central Province (13.3 per 100,000), followed by North-Western Province (10.9 per 100,000), and Eastern Province (9.9 per 100,000).

(5) **Thailand**

Figures of snakebite mortality are not separately compiled, deaths from this cause being recorded under Item E927 of the International Classification (1948 Revision) or Category 194 of the International List (1938 Revision). It is reported that, as far as observations go, the deaths included in these categories were seldom caused by any venomous animals other than poisonous snakes.

The following figures give the estimated loss of life from venomous animals in Thailand for the period 1946–50:

Year	Deaths
1946	168
1947	200
1948	263
1949	264
1950	224

The province with the highest death-rate per 100,000 is Trat (6.7), followed by Chumphon (4.5), Samut Prakan (4.4), Chantburi (3.8), Samut Sakhon (3.6), Phichit (3.2), Ayuthya (3.1) and Nakhon Pathom (3.1). For the remaining provinces the death-rate is below 3.0 per 100,000.

(6) **Singapore**

Two deaths from snakebite occurred in the colony of Singapore during 1948. During the years 1949–52, no snakebite death is known to have occurred.

(7) **Federation of Malaya**

Snakebite deaths recorded in Government hospitals during the years 1948, 1949 and 1950 were 6, 7 and 77 respectively. Late estimates put the number of snakebite cases at approximately 1,500 per year.

(8) **Vietnam**

Cases of snakebite are relatively more frequent in the south of Vietnam than in the central or northern parts of the country. During the period 1948–52, 124 cases of cobra bites were treated at the Institut Pasteur, Saigon;

of these two died. The Province of Cantho recorded four deaths from snakebite during 1948–50.

In central Vietnam snakes are rare and only two or three cases of snakebite were treated with no fatality.

In north Vietnam only one death from snakebite was registered during 1948–52.

(9) Syria

Separate figures for snakebite deaths are not available. Figures of annual deaths caused by poisoning, including deaths from snakebite, are given below:

Year	Deaths
1950	33
1951	39
1952	42

(10) Jordan

There were 84 recorded deaths from snakebite in the five-year period 1948–52 in Jordan. Their distribution by districts was as follows: Nablus (33), Northern (22), Jerusalem (18), Balqa (9) and Hebron (2).

(11) Iraq

Cases of snakebite treated in hospitals in Iraq during the period 1948–51, together with the number of deaths, are shown below:

Year	Cases	Deaths
1948	142	2
1949	182	1
1950	138	5
1951	336	4

f. Australia, The Far East, and Oceania.

(1) Australia

Annual total deaths from snakebite during the period 1942–50 for the whole of Australia are given below:

Year	Deaths	Year	Deaths
1942	6	1947	4
1943	6	1948	7
1944	9	1949	4
1945	8	1950	7
1946	5		

Of the total of 28 deaths during the period 1945–49, 18 occurred in the Province of Queensland, 6 in New South Wales, 3 in Western Australia, and 1 in Tasmania. No deaths from snakebite were recorded from the other provinces.

(2) Papua and New Guinea

The only figures in respect of snakebite cases in the territories of Papua and New Guinea are those relating to cases admitted to Administration Hospitals.

In Papua during the years 1949–52 there were 118 admissions to hospitals from snakebite; of these 9 persons died. In the same period, there were 123 admissions to New Guinea hospitals but no fatality.

(3) Fiji Islands

No case of snakebite or death from snakebite is known to have occurred in Fiji.

(4) Macao

No case of death due to snakebite was reported in Macao during the five-year period 1948–52.

(5) Hong Kong

During the twelve months from August 1951 to July 1952, 20 cases of snakebite were seen at the Queen Mary Hospital. It is stated that many cases are treated at home with Chinese remedies, or are not treated at all. If allowance is made for cases seen in other hospitals and for cases not seen at all, it is estimated that about 100 cases of snakebite occur in the Colony each year. No death from snakebite was recorded from 1949 to 1954.

(6) Japan

The figures of annual deaths for Japan given below relate, for the year 1950, to Item E 927 of the International Classification (1948 Revision) and, for the years 1947–49, to Categories 194 and 175ba of the International List (1938 Revision).

It is reported that about 90% of these deaths occurred from snakebite.

Year	Deaths
1947	90
1948	107
1949	119
1950	119

Prefectures showing relatively high death-rates (exceeding 0.40 per 100,000) are Shimane (0.68), Nagasaki (0.55), Saga (0.53), Miyazaki (0.50), Oita (0048) and Kagoshima (0.43). It is noteworthy that these prefectures lie in southern Japan, the majority being in Kyushu Island.

(7) Formosa

Incidence of Snakebite on Taiwan, 1904–1938

Species	Total Cases	Total Deaths	Deaths/ 100 Cases
T. mucrosquamatus	3,283	275	8.38
T. gramineus	5,987	54	0.90
A. acutus	240	58	24.17
V. russelli	45	1	2 22
N. naja atra	593	87	14.67
B. multicinctus	894	206	23.04
C. maclellandi	3	....	....
Unknown species	1,600	158	9.88
Total	12,645	839	6.64

(8) Philippines

Relatively few poisonous reptiles are found, and mortality from snakebite is therefore negligible.

(9) North Borneo, Sarawak and Brunei

In North Borneo figures of deaths included in the category "deaths from venomous animals" are available only since 1951. During 1951 there were no deaths recorded under this heading, and during 1952 only five deaths.

In Sarawak, no death from snakebite has been recorded. Registration of deaths from remoter parts of Sarawak is far from accurate and it is believed that Sarawak has a large number of snakes.

No death from snakebite is known to have occurred in Brunei during the period 1945–52.

(10) Pacific Islands

The territories of the Pacific Islands, stretching from 1 degree N to 20 degrees N, and from 130 degrees E to 170 degrees E, are composed of about 2,140 individual islands.

No deaths from snakebite have been recorded on these islands.

3. SOURCES OF ANTIVENOM

Country	City	Producer	Product	Species-Venoms Neutralized
United States	Philadelphia	Wyeth Laboratories	Antivenin *Crotalidae* Polyvalent.	All species of the *Crotalidae* (pit vipers, including *Crotalidae, Agkistrodon, Sistrurus, Bothrops, Lachesis, Trimererus*).
West Germany	Marburg-Lahn	Behringwerke Aktiensgesellschaft.	*Crotalus terrificus* anti-venom.	*C. terrificus.*
			Brothrops atrox anti-venin.	*B. atrox.*
			Schlangenbiss-Serum Anti-Kobra Serum.	*Naja haje, N. nivea, Sepedon* *** *haemachates* and other African species.
			Schlangenbiss-Serum (Puff-Otter Anti-Serum).	*Bitis arietans.*
			Schlangenbiss-Serum (*Echis carinatus* anti-serum).	*Echis carinatus.*
			Schlangenbiss-Serum (anti-*Ammodytes* serum).	*Vipera aspis, V. berus, V. ammodytes, V. lebetina.*
Brazil	Sao Paulo	Instituto Pinheiros Rua Teodoro Sampaio, 1860.	Soro Anti-Ofidico (Polyvalent).	*Crotalus terrificus terrificus* and *Bothrops atrox.*
			Soro Anti-Botropico	*Bothrops* species: *B. atrox, jararacussu, alternata, cotiara; Lachesis muta.*
			Soro Anti-Crotalico	*C. terrificus terrificus.*
		Instituto Butantan Caixa Postal 65.	Soro Anti-Crotalico	*C. terrificus terrificus.*
			Soro Anti-Botropico	*Bothrops* species.
			Soro Anti-Ofidico	*C. terrificus terrificus* and *Bothrops* species.

Country	City	Producer	Product	Species-Venoms Neutralized
			Soro Anti-Laquetico	*Lachesis muta.*
			Soro Anti-Elapidico	*Micrurus* species.
France	Paris	Institut Pasteur Service de Serotherapie, 36 Rue du Doctor-Roux.	Serum Antivenimeux	*Vipera aspis, V. berus.*
			Serum Antivenimeux AO.	*Bitis arietans, B. gabonica** and *Naja* species.
			Serum Antivenimeux C.	*Naja* of Egypt, India and Indo-China.
Italy	Milan	Instituto Sieroterapico.	Siero Antivipera per l'Europa.	All European vipers.
Yugoslavia	Zagreb	Central Institute of Hygiene.	Serum Antiviperinum	*Vipera ammodytes* and *V. berus.*
Austria	Wien X	Serotherapeutisches Institut Wien, Triesterstrasse 50.	Schlangenbiss-Serum	Any European vipers.
Union of South Africa.	Johannesburg	S.A. Institute for Medical Research.	Antisnake serum (Polyvalent).	All important venomous snakes of South Africa.
Natal	Durban	FitzSimon's Snake Park Laboratory.	FitzSimon's Anti-Venomous Serum.	All African poisonous snakes.
Algeria and France.	Algiers Paris.	Institue Pasteur d'Algerie.	Serum Antivenimeux Antiviperin AN.	*Cerastes* and *Naja* of North Africa.
India	Bombay	Haffkine Institute	Polyvalent Anti-Snake Venom Serum.	*Naja naja, Bungarus coeruleus, Vipera russelli; Echis carinatus.*
	Kasauli	Central Research Institute.	Concentrated Anti-Venom.	*Naja naja, Vipera russelli, Echis* (phoorsa).
Japan	Tokyo	Institute for Infectious diseases, Univ. of Tokyo.	Polyvalent Antivenine Serum.	*Trimeresurus flavoviridis* and *Agkistrodon halys.*
Burma	Rangoon	Burma Pharmaceutical Industries.	Anti-Cobra and Anti-Viper Serum.	(**).
Pakistan	Karachi	Pakistan Bureau of Laboratories.	Concentrated Anti-venom Serum.	(**).
Iran	Hessarak-Karadj.	Razi Institute	(**)	(**).
Taiwan	Taipei	Taiwan Serum-Vaccine Laboratory.	Polyvalent Haemorrhagic Antivenine.	*T. gramineus, T. macrosquamatus.*
Philippines	Manila	Alabang Serum and Vaccine Laboratory.	Philippine Cobra Antivenine.	Philippine cobras only.
Indonesia	Bandung	Gedung Tjatjar Den Lembaga Pasteur.	Polyvalent Antivenine.	*Akgistrodon rhodostoma, Bungarus candidus, Naja tripudians.*
Thailand	Bangkok	Queen Saovabha Memorial Institute of the Thai Red Cross.	Polyvalent Antivenine.	Cobras, true vipers and pit vipers of Thailand.
			Cobra Antivenine	Thai subspecies of *Naja naja, N. hamadryad,* and presumably the krait.
			Viper Antivenine	Thai subspecies of *Vipera russelli.*
			Agkistrodon rhodostoma Antivenine.	*A. rhodostoma.*

Country	City	Producer	Product	Species-Venoms Neutralized
Australia	Melbourne	Commonwealth Serum Laboratories.	Tiger snake Antivenine	*Notechis scutatus*, *Acanthophis antarcticus*, *Denisonia superba*, *D. textilis*, *Pseudechis porphyriacus* and *Oxyuranus scutellatus*.
			Sea Snake Antivenom	Malayan species.
Colombia	Bogota	National Health Institute.	Polyvalent Antiophidia.	*Bothrops* and *Crotalus*.
Egypt	Agouza	Production of vaccine in experimental stage at present time.		

*It has been reported that AO antiserum does not neutralize *B. gabonica* venom.

**No data available.

***Now known as *Hemochatus haemochates*.

4. GLOSSARY OF TERMS

The words and terms defined here have either a special meaning applying to this study or are scientific terms which apply especially to the study of snakes. At least some of these terms have different meanings depending upon how they are used. In the latter instances, only that definition having application in this study is supplied.

Acute—(angle) less than 90°; pointed.
Adjunct—Something added to another, but not essentially a part of it.
Agile—Nimble; quick in movement; brisk; active.
Aglypha—Having no fangs.
Anal plate—The ventral plate immediately anterior to the vent.
Angulate—Angled; cornered.
Annulus—(plural: annuli) A ring or band completely surrounding the body.
Anoxia—Oxygen deficiency or lack of oxygen.
Anterior—The front part; towards the front or head.
Antivenene—A serum containing antibodies against the venom of snakes.
Antivenom—Same as antivenene.
Apical scale—A scale that sometimes occurs between the internasals and the rostral shield in snakes; also called the post-rostral shield or scale.
Apical pit—A small depression occurring at the posterior tip of the dorsal scales in some species of snakes.
Apices—Plural of apex which is the tip, point, or angular summit of anything; a vertex.
Appendage—A subordinate part; an external organ, part or limb.
Arboreal—Inhabiting or frequenting trees.
Aspect—Position facing a particular direction; also, the part so facing; view.
Bilobed—Divided into two lobes.
Blotch—A spot of color, usually with irregular borders.
Canthals—In some snakes, the border scales of the crown between the internasals and the supraoculars.
Canthus rostralis—The outer edge of the crown where it turns downward on the side, extending from the rostral to the supraocular.
Caudals—The ventral plates of a snake's tail; in either one or two series. In the case of divided caudals, each pair is counted as one; same as subcaudals.
Cervical—Pertaining to the neck or any neck-like part.
Chin shields—Shields which occur on the ventral side of a snake's head immediately posterior to the mental shield.
Colubrid—Pertaining to members of the family *Colubridae.*
Commissure—The angle of a snake's mouth; where the upper and lower jaws meet.
Confluent—Flowing or coming together to form one.
Convex—Curved or rounded as the exterior of a circular form.
Costals—Another name for the dorsal scales of a snake; pertaining to the ribs.
Crescentic—Shaped like the moon in its first quarter.
Crossbands—Bands of color completely surrounding the snake's body.
Crossbars—Bands of color which do not completely encircle the snake's body.
Cruciform—Cross-shaped.
Cuneate—Wedge-shaped, triangular.
Cuneiform—Same as cuneate.
Cytolytic—Productive of, or effecting cell destruction.
Decussating—Crossing like an "X".
Dentition—The number, kind and arrangement of teeth.
Dermal—Pertaining to the skin.
Dichotomous—Division into two parts (generally opposites); said of keys in which, at each stage, there are two choices.
Diffusible—Capable of being spread throughout.
Dilatable—Capable of being distended, enlarged, or extended in size.
Distal—Remote from the point of attachment.
Diurnal—Most active during the day.
Divided—Said of anal and subcaudal plates when they occur in pairs.
Disproportionate—Out of proportion.
Dorsum—The back or top side of a snake.
Dorsal—Pertaining to the back or top side.

Eject—To throw out or expel, as venom from fangs.
Elliptical—Said of eyes of snakes whose pupil is slit-like, in a vertical plane.
Elongate—Lengthened or stretched out.
Entire—In one piece; said of scales, shields and other structures which are not divided.
Envenomation—The process whereby venom is injected into one's body.
Erectile—Said of scales on snake's heads which resemble horns; scales which are vertically erect or stand up in a vertical plane.
Estuary—An arm of the sea at the lower end of a river or stream; a firth.
Excretory—Pertaining to, or serving for the process of elimination.
External—On the outside.
Fangs—Long sharp teeth by which the prey of an animal is seized and held; any long pointed teeth; long, hollow or grooved, and sometimes, erectile, teeth of venomous snakes, through which poison flows when one is bitten.
Festoon—A blotch of color resembling a wreath.
Foveal—Of or pertaining to a pit.
Frontal—A large shield on the dorsal side of a snake's head.
Fused—United or blended together.
Gape—The median margin-to-margin length of the open mouth.
Genials—The chin shields.
Generic—Pertaining to or having the rank of a genus.
Girth—The measure around the body; the circumference of anything.
Ground color—The background color of a snake.
Gular—Throat scales of a snake which occur between the chin shields and the ventral plates; also lateral scales in the same region.
Habitus—The natural abode or place where the animal is commonly found.
Head shields—Relatively large armor-like structures occurring on the head.
Hemolytic—Causing the liberation of hemoglobin from red blood cells.
Hemotoxic—Poisonous to the blood; also due to toxic destruction of blood cells.
Hematuria—The discharge of blood into the urine.
Hexagonal—Six-sided.
Hypertension—Abnormally high tension; especially high blood pressure.
Imbricate—Overlapping.
Immobilization—The state of being immobile or immovable.
Inferior—Situated below some other structure.
Infralabials—The shields situated on the lower lips.
Intergenials—Scales that occur in some snakes between the chin shields.
Internasals—Shields that occur between the nostrils of snakes.
Interorbital—Between the eyes.
Intramuscular—An injection given in the body of a muscle.
Intracutaneous—An injection given in (not below) the skin.
Intravenous—An injection given in a vein.
Juxtapose—Side by side (not overlapping).
Keel—A raised or ridged structure occurring on the scales.
Labials—The lip shields.
Lacrimal—Pertaining to tears; also, said of structures occurring near the commissure of the eyes in snakes.
Lateral—Of or pertaining to the side.
Latero-ventral—Pertaining to the lateral and ventral sides of snakes.
Loreal—Shield(s) on the heads of some snakes, situated or bordering the prefrontals and upper labials and between the nostril and the eye *but bordering neither.*
Malevolent—Evil or vicious looking.
Mandible—Lower jaw.
Margination—Referring to blotches bordered or surrounded by narrow portions of other color.
Matrix—The internal solid base of the rattle in rattlesnakes.
Maxilla—The upper jaw.
Medial—Being, situated, or occurring, in the middle.
Median—Lying in a plane dividing an animal into right and left halves.
Mental—The shield at the anterior end of the lower jaw in snakes; sometimes called the symphysical.
Metabolism—The sum of the processes of the building up of protoplasm and its destruction incidental to life.
Nape—The back of the neck.
Naso-rostral—A shield occurring between the nostril and the rostral shield.
Neurotoxic—Adversely affecting the nervous system.
Neurotoxin—A toxin or poison which affects the nervous system.
Nocturnal—Most active during the night.
Nose shield—The rostral shield.
Nuchal—Pertaining to the neck.
Oblique—Slanting.
Obtuse—Not pointed; blunt.
Obtusely pointed—Bluntly pointed.
Occipitals—Shields occurring on the head of some snakes, immediately posterior to the parietals.
Occiput—The back part of the skull.
Ocelli—Round-shaped blotches, resembling eyes.
Ochreous—Of an earthy, yellow color.
Ocular—Pertaining to the eye.
Ocular ring—The ring of shields surrounding the eye.
Olivaceous—Olive-green color.
Opisthoglypha—A rear-fanged snake.
Orbit—The border around the eye.
Paired—Occurring in twos; said of anal and subcaudal plates.
Palatine—Pertaining to the upper inside of the mouth.
Parietals—A pair of shields on the heads of some snakes immediately posterior to the frontal shield.
Pathological—Morbid; due to disease or injury.

Pelagic—Of or pertaining to the ocean; a true ocean-going snake.

Pentagonal—Having five sides.

Phlyctenae—Blisters, filled with serous fluid, forming as a result of envenomation by certain species of reptiles.

Plates—The ventral scutes or scales of snakes with which they perform locomotion.

Posterior—Situated behind or toward the rear.

Postnasal—Shields situated to the rear of the nostril.

Postocular—Shields occurring behind the eye.

Postrostral—Small shield occurring behind the rostral; the apical scale.

Predatory—Living by preying on other animals.

Prefoveal—Situated before or in front of the pit.

Prefrontals—Shields occurring before the frontals.

Prehensile—Adapted for seizing or grasping, especially by wrapping around; said of the tails of snakes adapted to life in trees.

Prenasal—Shields or scales situated in front of the nostril.

Preocular—Shields occurring in front of the eye.

Proboscis—Any of various processes or prolongations of the heads of animals.

Proteroglypha—The group of snakes having permanently erect fangs situated in front of the other teeth at the very front of the head.

Proximal—Towards or near the point of attachment.

Quadrangular—An area enclosed by four sides and having four angles.

Recurved—Curved in an opposite or unusual direction; bent backwards.

Reniform—Shaped like a kidney.

Rhomb—A six-sided prism whose faces are parallelograms.

Rhomboid—A parallelogram in which the angles are oblique and the adjacent sides are unequal; said of some of the patterns of color occurring in snakes.

Rossette—Something resembling a rose, as in shape or color.

Rostral—The most anterior upper head shield.

Rugose—Full of wrinkles.

Scalation—The structure and arrangement of the shields, scales and plates.

Scales—Small flattened, rigid structures covering the lateral and dorsal portions and sometimes the head of snakes.

Scute—A scale, shield or plate of snakes.

Sensory—Conveying nerve impulses from the sense organs to the nerve centers.

Serrated—Notched or toothed on the edge, like a saw.

Shields—A protective structure, likened to a shield, resembling armor, occurring on the head.

Sham—To make false pretenses; to deceive.

Snout—The anterior prolongation of the head.

Solenoglypha—Snakes having erect tubular or hollow fangs.

Spatulate—Spoon-shaped.

Squamation—The arrangement of scales, shields and plates of snakes; the scalation.

Stippling—An even or softly graded shadow.

Striated—Marked with minute grooves, or channels; thread-like lines or narrow bands.

Sub (as a prefix)—Signifying, in general order, under, below, beneath, or not quite reaching a certain size or shape.

Subacuminate—Under a tapering point.

Subcaudals—Beneath the tail.

Subcuneiform—Not quite wedge-shaped.

Subcutaneous—Under the skin.

Subelliptical—Not quite elliptical in shape.

Subimbricate—Just barely overlapping.

Suffusion—Spreading, as with a fluid or color; tingeing or painting.

Superficial—That seen at first view; external.

Superior—Situated above or towards the top.

Supra (prefix)—In general equivalent to super-; used especially in forming scientific words denoting above in position; on the dorsal side of.

Supra-anal plates—Plates occurring above the anus or vent.

Suture—The line or union, or seam, in an immovable articulation.

Symmetrical—Having or exhibiting symmetry, or, especially, correspondence in size or shape of a part.

Temple—The flattened space on either side of the head behind the eyes.

Temporals—Shields occurring posterior to the postoculars between the posterior upper labials and the parietals.

Terrestrial—Pertaining to the earth or ground as opposed to the aquatic environment.

Thrice—Three times, or in a three-fold manner.

Tissue sheath—A scabbard-like tissue covering of the fangs in certain snakes.

Toxic—Poisonous.

Transverse—Lying or being across.

Tricuspid—Three-pointed.

Trident—Having three teeth or points.

Truncated—Having a squared or even end.

Tuberculated—Having small knoblike prominences.

Undulous—Wavy.

Valvular—Opening like, with or by a valve.

Variegated—Marked with several colors.

Venom—The poison matter secreted by snakes.

Vent—A small aperture; a hole or opening for passage or escape, as of a fluid; the anus of snakes.

Ventral—Of or pertaining to the belly.

Ventrals—The ventral or belly plates of snakes.

Vermiculated—Worm-like, twisted colorations appearing in the color patterns of some snakes.

Vermilion—Bright red color.

Vertebral—Pertaining to the spinal column.

Vertebrals—Scales on the median dorsal line.

Vertex—The highest point of the head or skull.

Vertical—Straight up and down direction.

Vestige—A small, degenerate, or imperfectly developed part or organ.

Vestigial—Pertaining to a vestige.

Virulence—Toxic; degree of toxicity.

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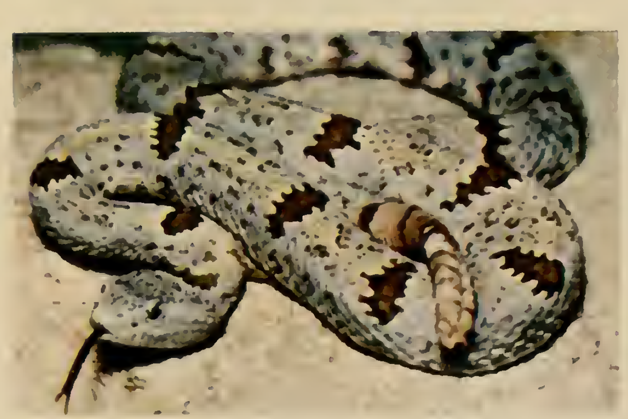


FIGURE 1. *Crotalus lepidus* (Rock Rattlesnake).

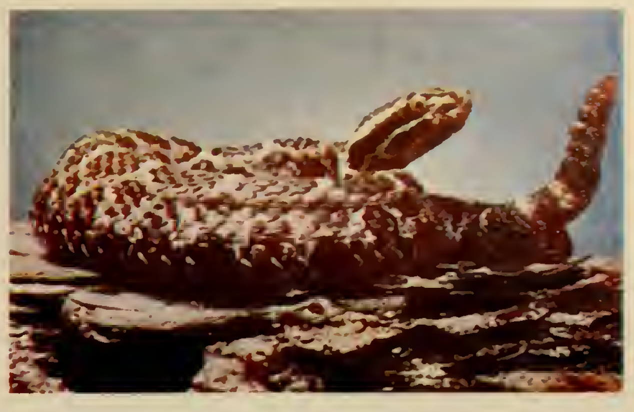


FIGURE 2. *Sistrurus catenatus* (Eastern Massasauga).

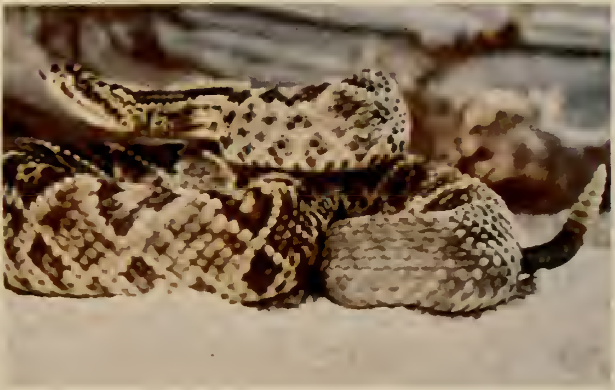


FIGURE 3. *Crotalus durissus* (South American Rattlesnake).

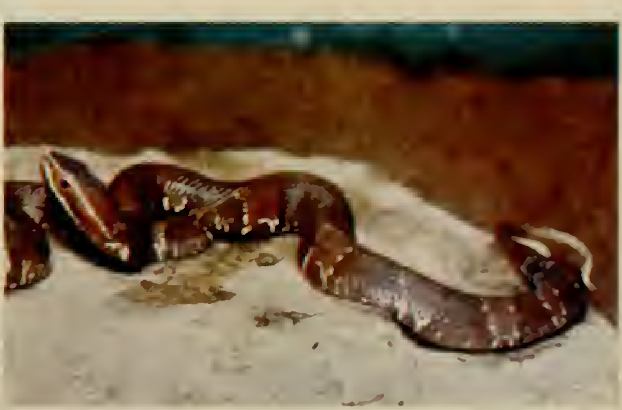


FIGURE 4. *Agkistrodon bilineatus* (Mexican Moccasin).

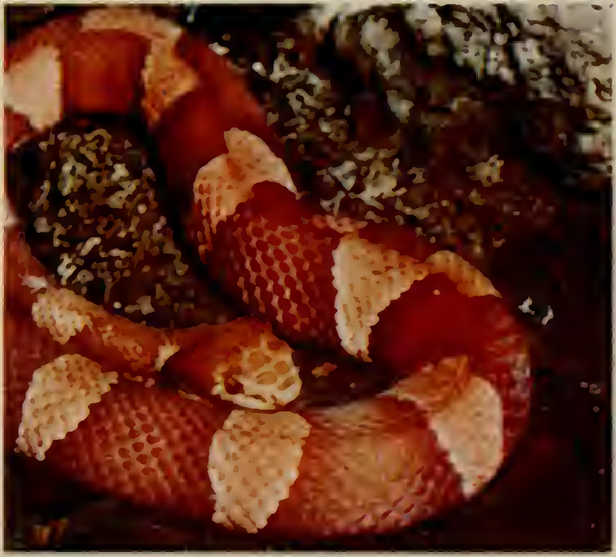


FIGURE 5. *Agkistrodon contortix laticinctus* (Broad-banded Copperhead).

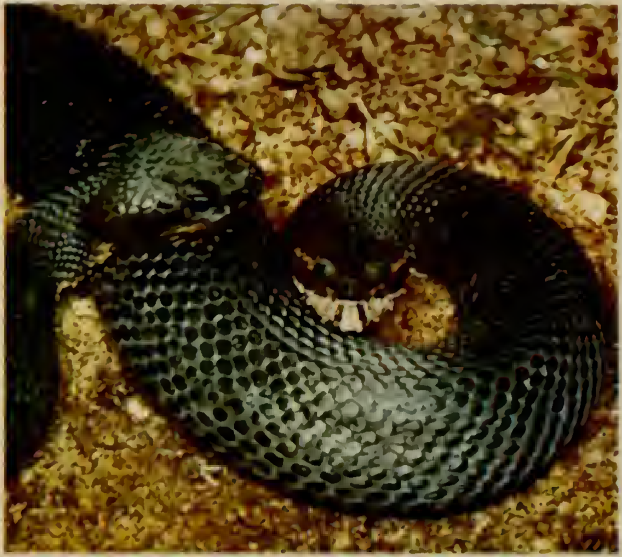


FIGURE 6. *Agkistrodon piscivorus* (Water Moccasin).

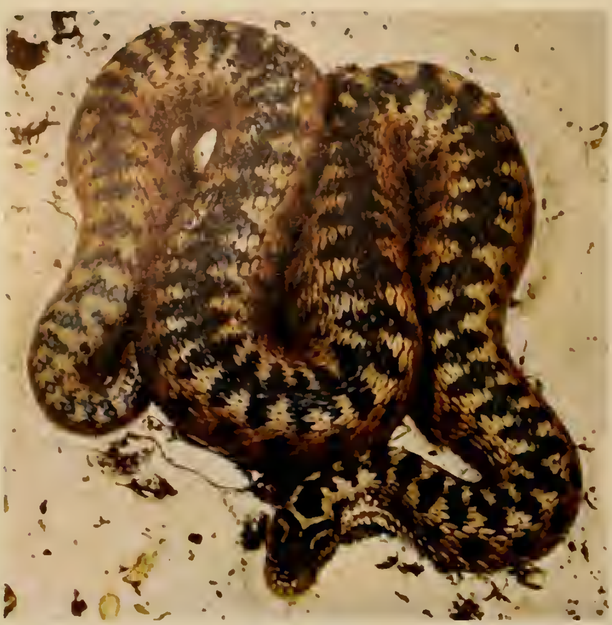


FIGURE 7. *Vipera berus berus* (Common European Viper).

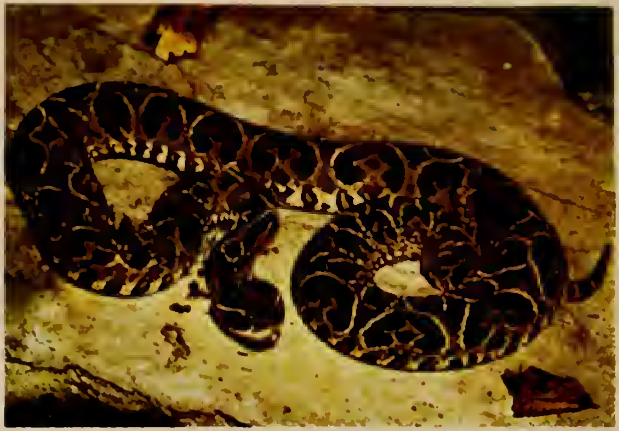


FIGURE 8. *Bothrops alternatus* (Wutu).

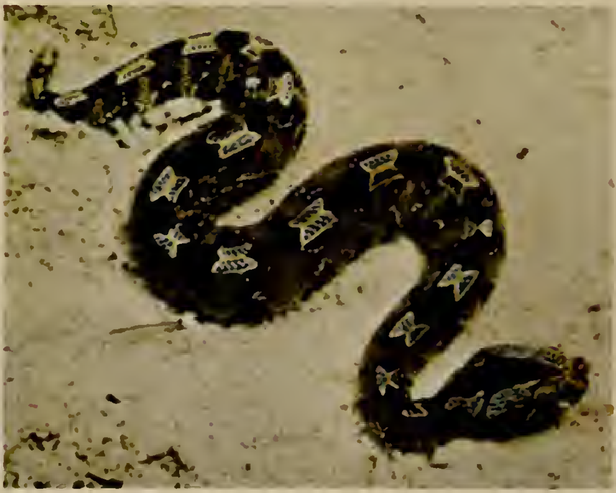


FIGURE 10. *Bitis nasicornis* (Rhinoceros Viper).

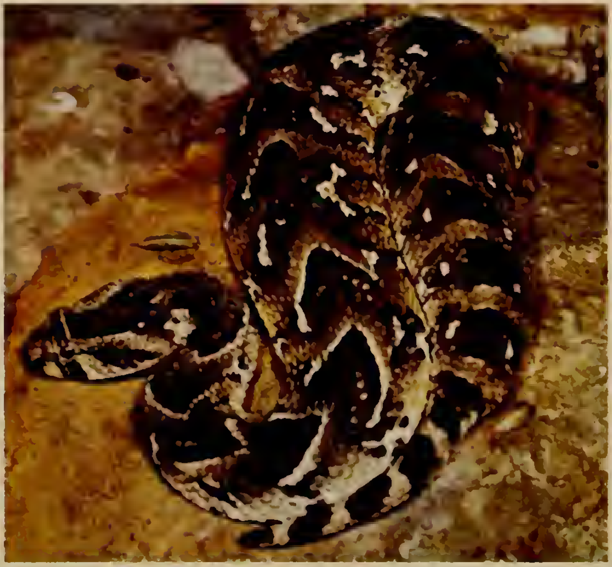


FIGURE 9. *Bitis arietans* (Puff Adder).

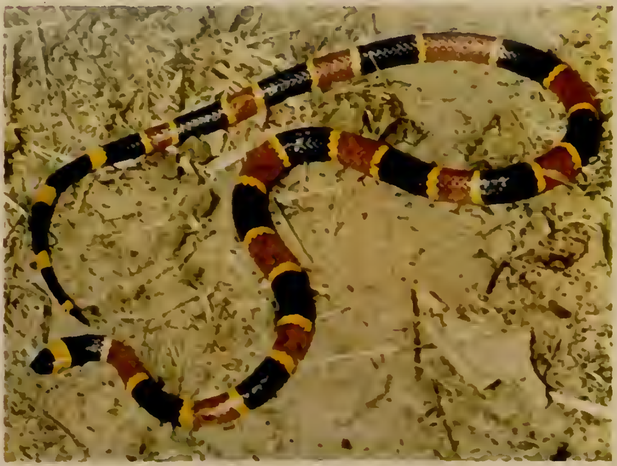


FIGURE 11. *Micrurus fulvius* (Eastern Coral Snake).

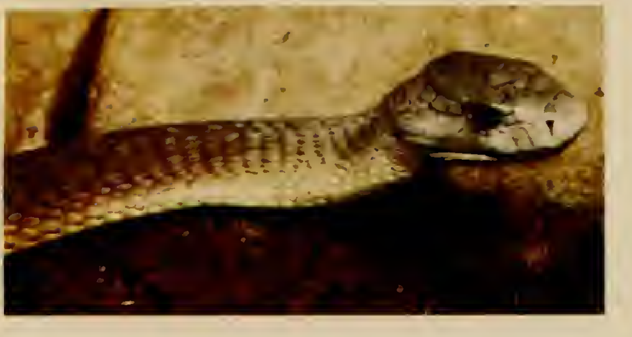


FIGURE 12. *Dendroaspis polylepis* (Black Mamba).

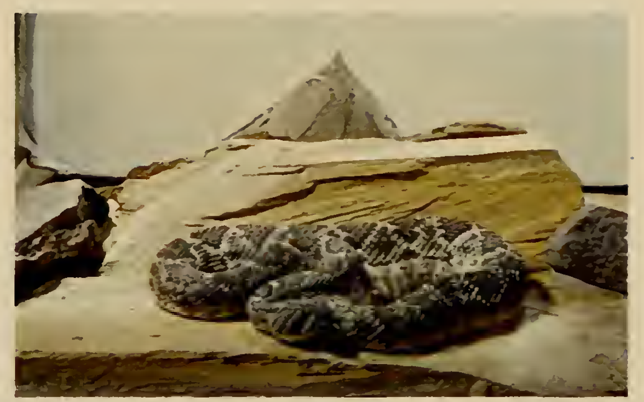


FIGURE 13. *Crotalus atrox* (Western Diamond-back Rattlesnake).

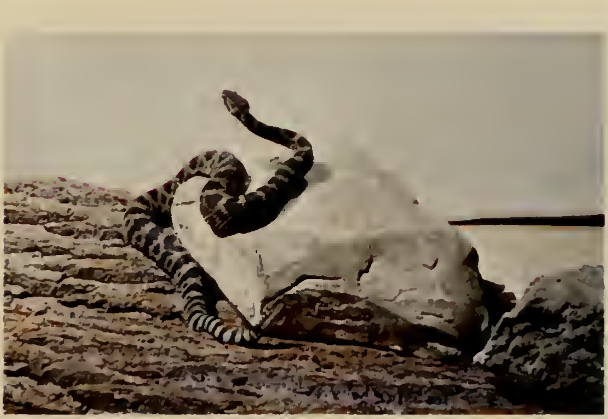


FIGURE 14. *Crotalus viridis viridis* (Prairie Rattlesnake).

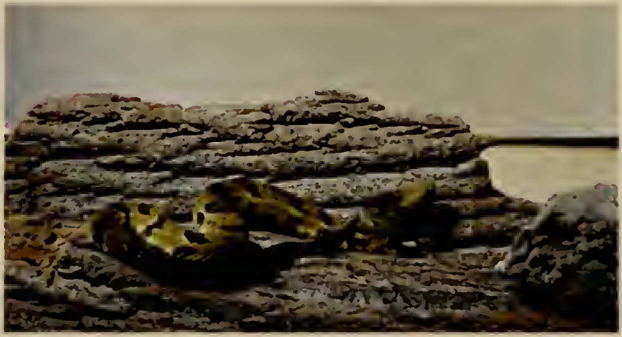


FIGURE 15. *Crotalus horridus* (Timber Rattlesnake).

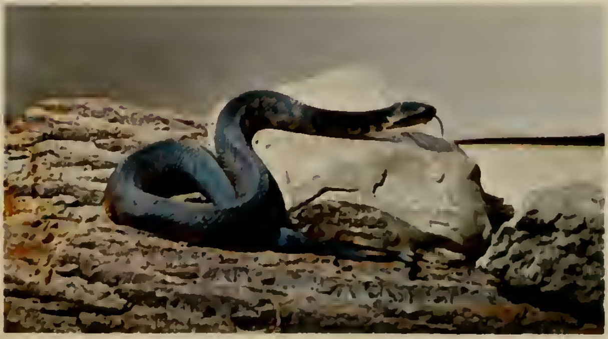


FIGURE 16. *Agkistrodon piscivorus* (Water Moccasin).

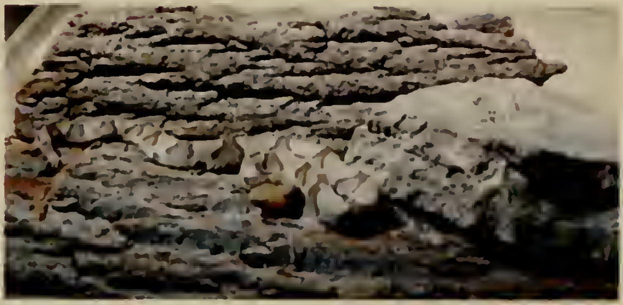


FIGURE 17. *Agkistrodon contortix mokeson* (Northern Copperhead).

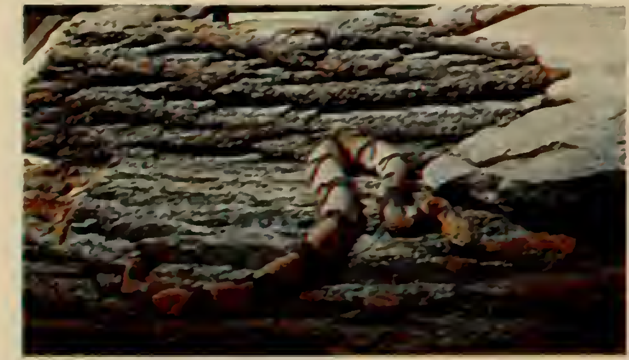


FIGURE 18. *Agkistrodon contortix contortix* (Southern Copperhead).

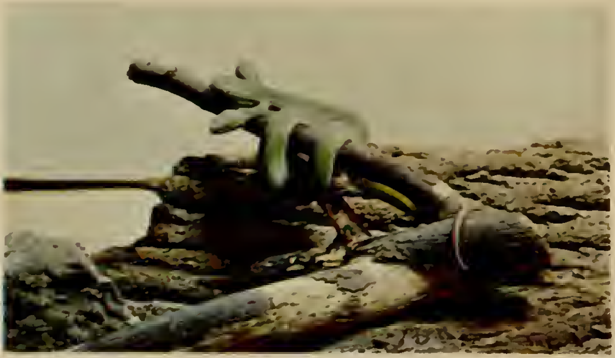


FIGURE 19. *Trimeresurus gramineus stejnegeri* (Stejneger's Palm Viper).

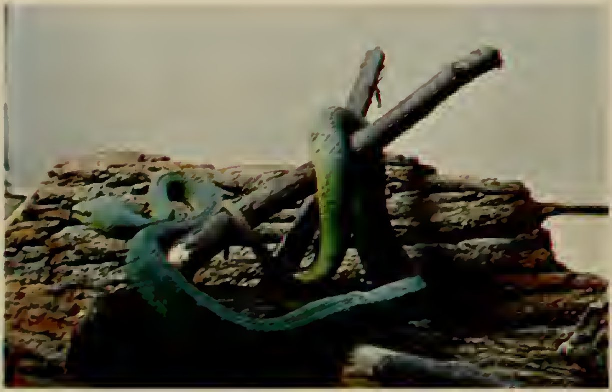


FIGURE 20. *Trimeresurus gramineus gramineus* (Awohabu).

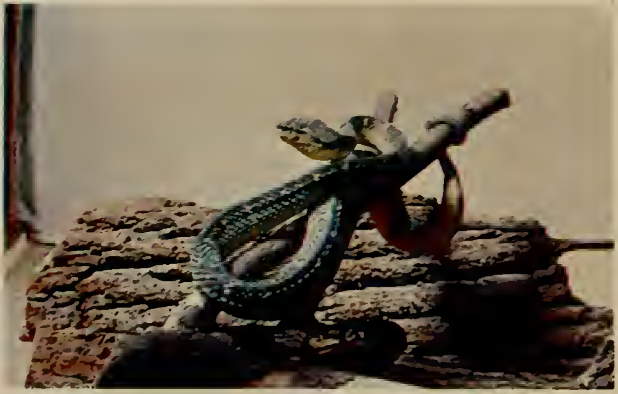


FIGURE 21. *Trimeresurus wagleri* (Wagler's Palm Viper).

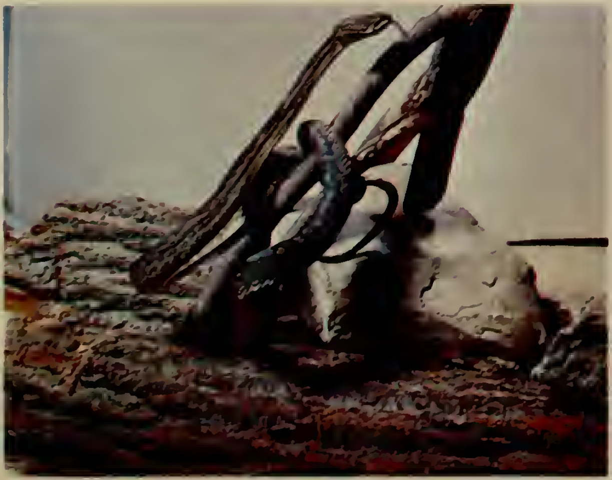


FIGURE 22. *Trimeresurus flavoviridis* (Habu).

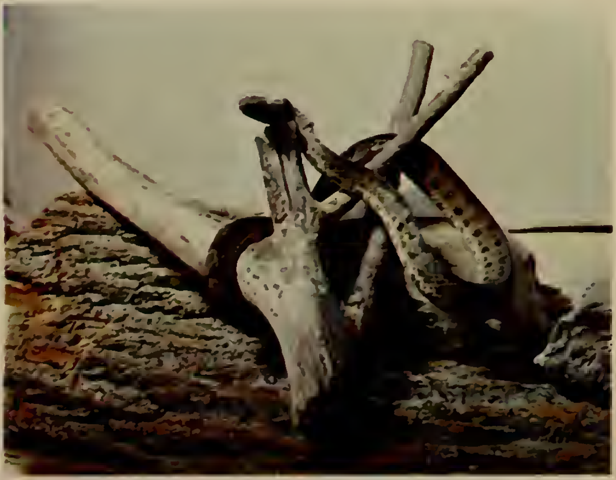


FIGURE 23. *Trimeresurus elegans.*

COLOR PHOTOGRAPHS OF TYPICAL AND MOST COMMON SPECIES

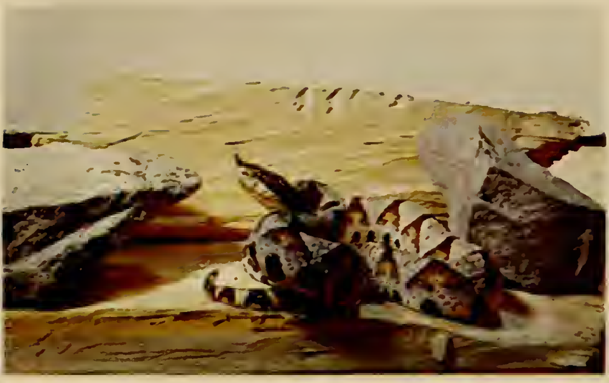


FIGURE 24. *Agkistrodon acutus* (Hyappoda).

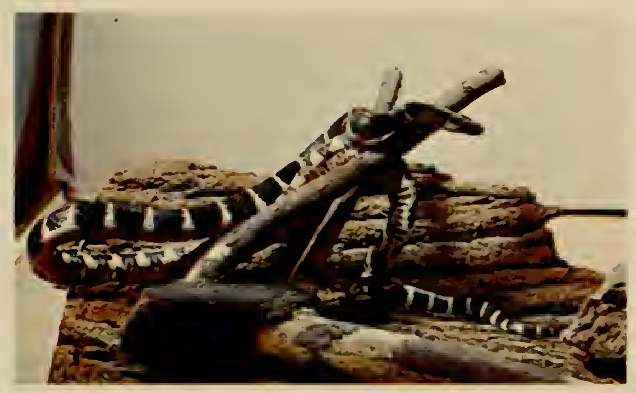


FIGURE 25. *Bungarus multicinctus* (Many-banded Krait).

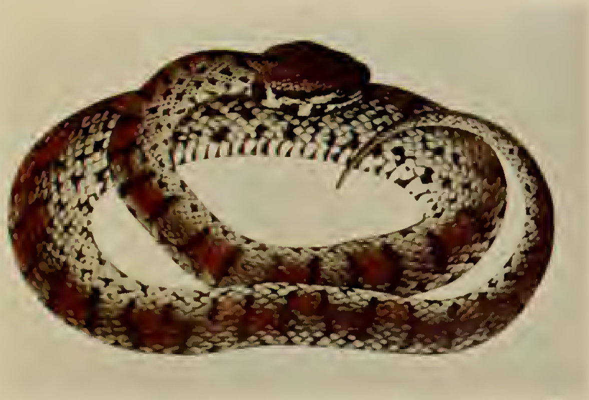


FIGURE 26. *Trimeresurus monticola orientalis* (Arisan-habu).

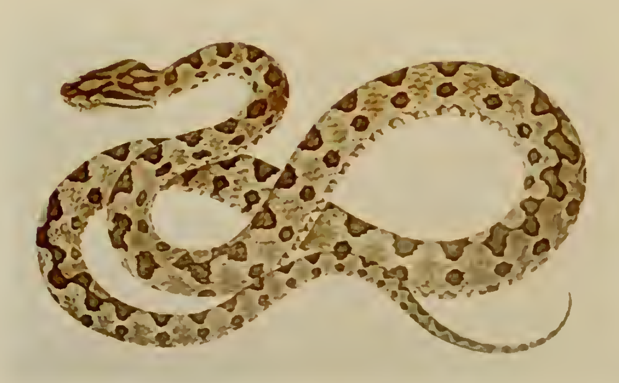


FIGURE 27. *Trimeresurus mucrosquamatus* (Taiwan habu).

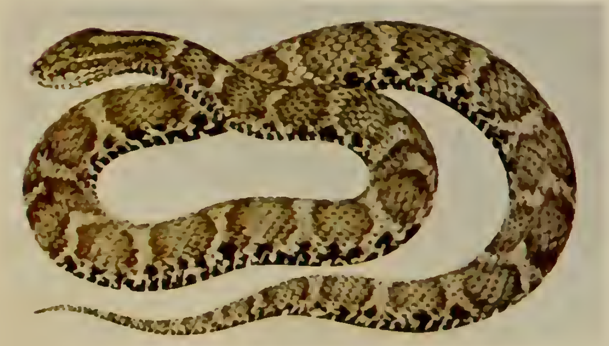


FIGURE 28. *Agkistrodon halys blomhoffi* (Mamushi).

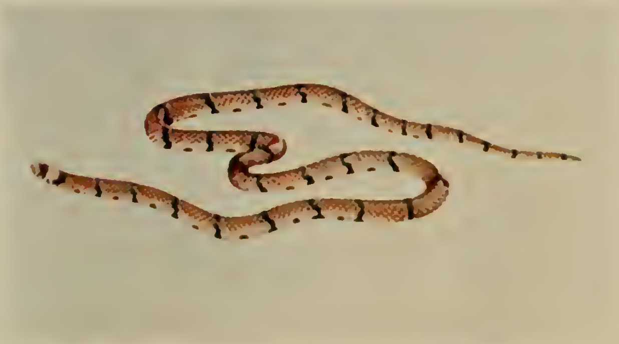


FIGURE 29. *Callophus macclellandii swinhoei* (Wamon-beni-hebi).

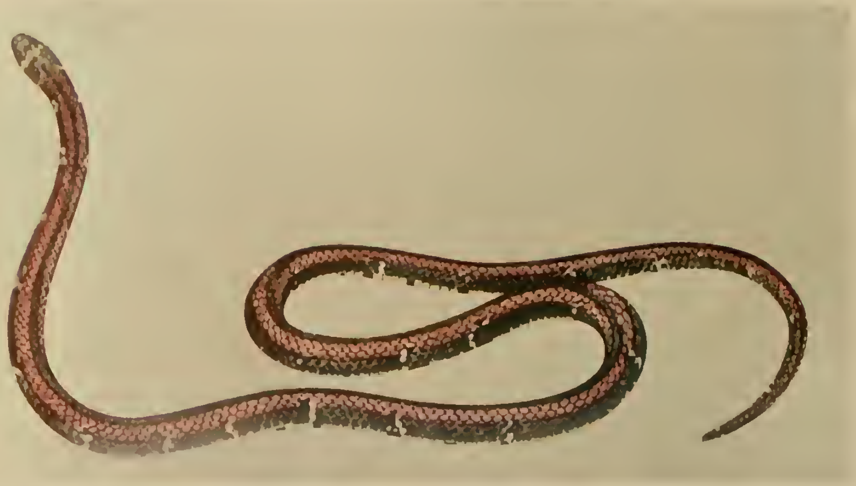


FIGURE 30. *Hemibungarus sauteri hatorii* (Hatori-hai).

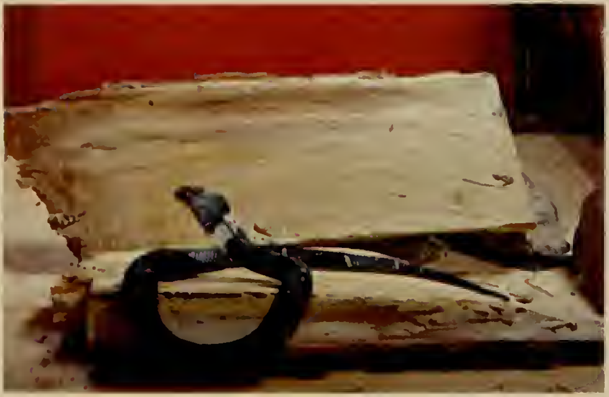


FIGURE 31. *Naja naja atra* (Taiwan cobra juvenile).

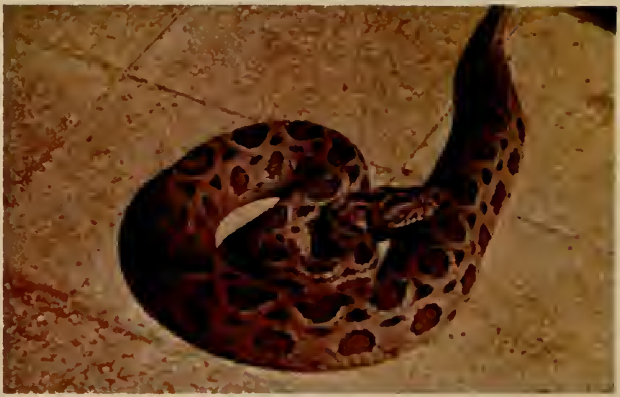


FIGURE 32. *Vipera russelli* (Russell's Viper).

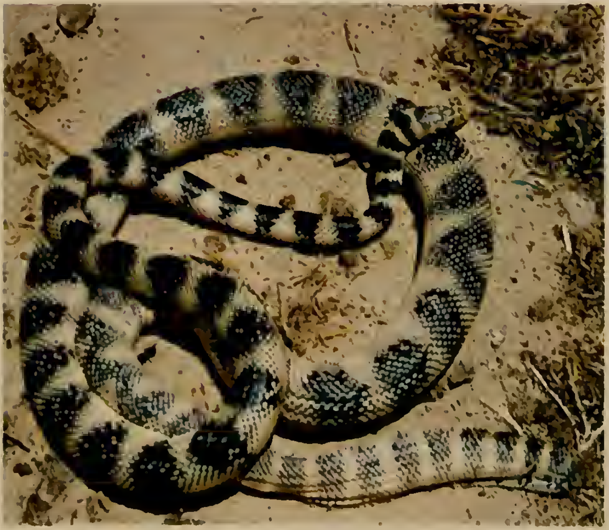


FIGURE 33. *Hydrophis cyanocinctus* (Sea Snake).

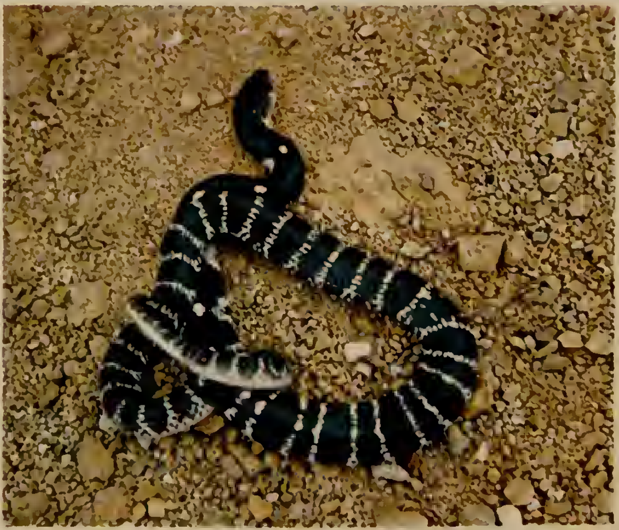
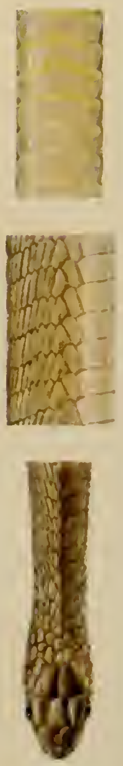
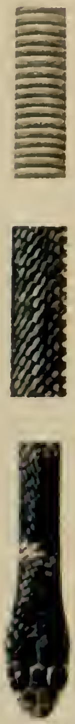
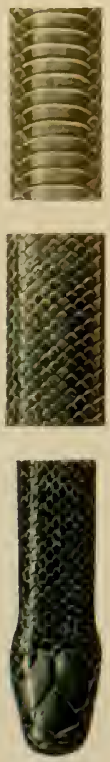
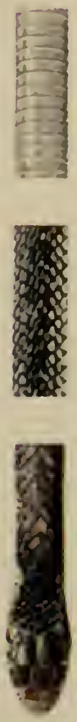


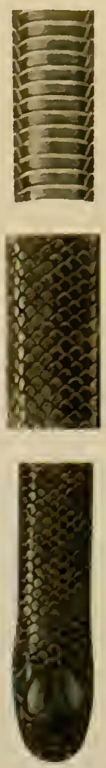
FIGURE 34. *Bungarus candidus* (Common krait).

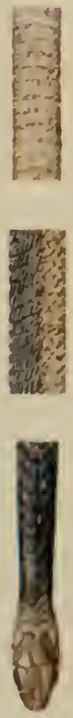

Dispholidus typus (brown form) Boomslang.

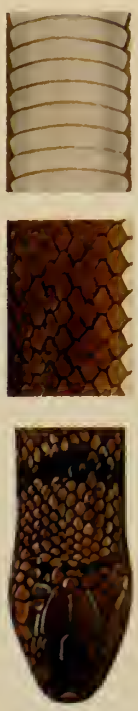

Dispholidus typus (juvenile) Boomslang.

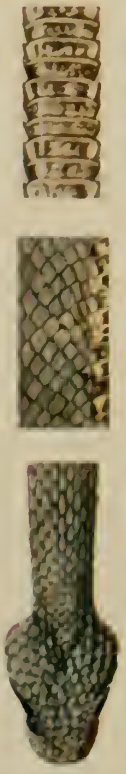

Atractaspis irregularis Burrowing Viper.

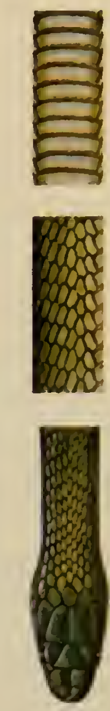

Naja melanoleuca (juvenile) Cobra.

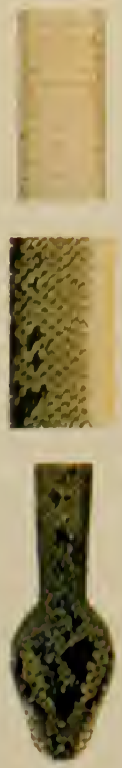

Atractaspis aterrima Burrowing Viper.


Naja goldii Cobra.


Boulengerina annulata stormsi Water Cobra.


Atheris squamigera Tree Viper.


Dendroaspis jamesoni kaimosae Jameson's Mamba.


Atheris nitschei Tree Viper.

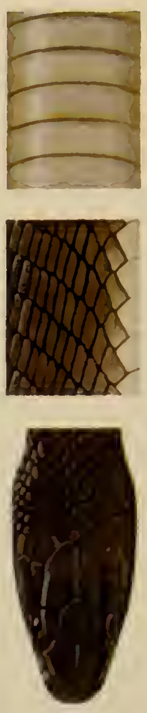
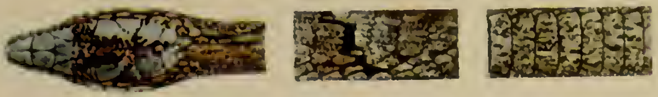
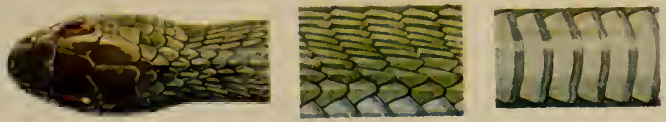

Dendroaspis angusticeps Mamba.

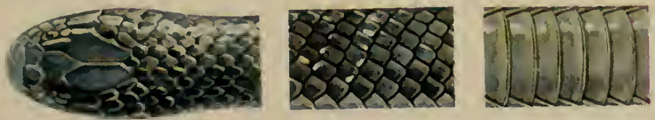
FIGURE 35



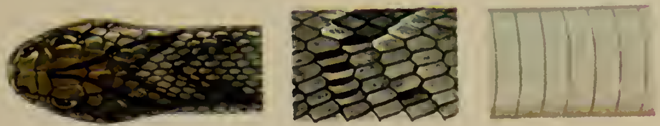
Thelotornis kirtlandii Twig or Vine Snake.



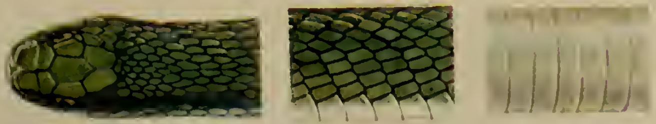
Dispholidus typus (green form) Boomslang.



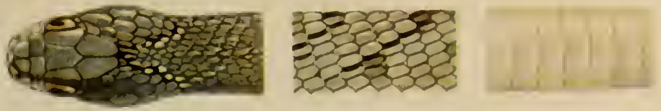
Elapsoidea guentheri.



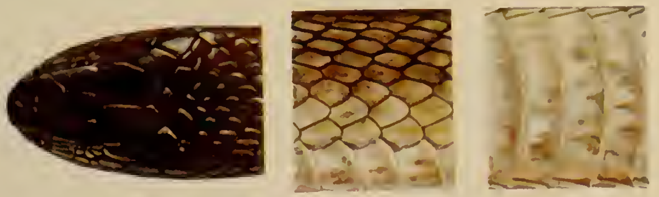
Causus rhombeatus Night Adder.



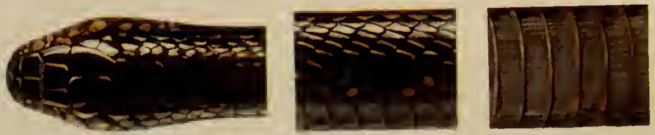
Causus resimus Night Adder.



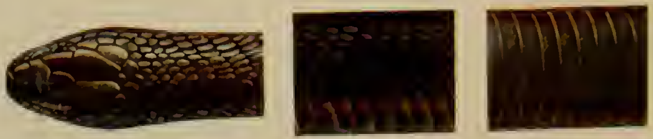
Causus lichtensteinii Night Adder.



Naja haje Egyptian Cobra.



Naja melanoleuca Cobra.



Naja nigricollis Cobra.

FIGURE 36